

The **MINING** *CONGRESS* *JOURNAL*



EIGHTH ANNUAL COAL CONVENTION *and* EXPOSITION

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Sitting on the Safety Valve

Traditions of steamboat racing on the Mississippi record occasional catastrophes due to reckless disregard for safety with respect to boiler pressure.

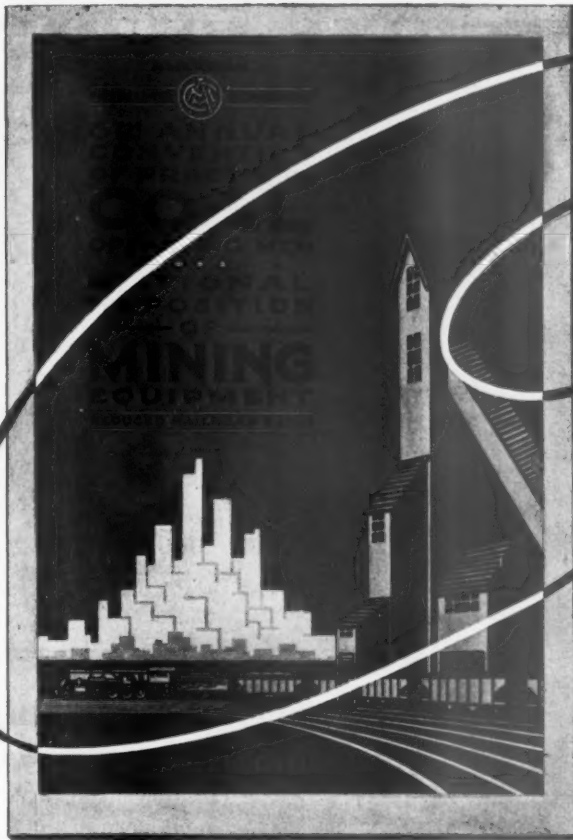
A dangerous expedient, but scarcely more so than some of those practiced by mine workers engaged in the use of explosives.

As manufacturers for more than a hundred years of safety fuse for blasting, we urge strict enforcement of proper procedure in its use. Blasting can, and should be, an inherently safe operation.

▲
"Do not short Fuse"
 --Fuse should be cut long enough for the end to extend well out of the mouth of the bore hole when the primer cartridge is in place.
 All holes should be well tamped.
 ▼



THE ENSIGN-BICKFORD CO.
 SIMSBURY CONNECTICUT

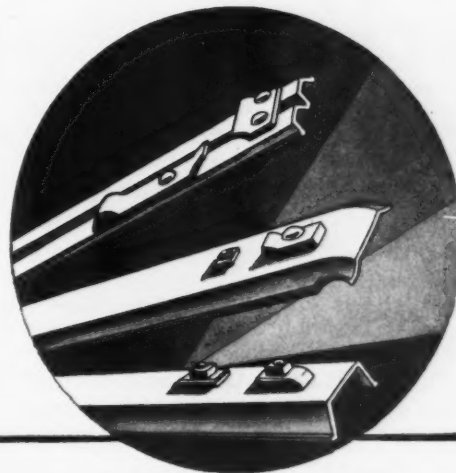


certainly
CARNEGIE
MINE TIES
will be
THERE
at
SPACE 101

IF YOU are interested in enduring track equipment, drop in at Space 101 and inspect Carnegie Copper-Steel Mine Ties. A recent test on Copper-Steel ties showed their loss of weight from corrosion to be only $\frac{1}{3}$ to $\frac{1}{2}$ as much as that for ordinary steel ties. Copper-Steel's protection is of particular importance in mines where floors are damp, as excess moisture hastens the destructive action of rust.

Many other advantages recommend the use of Carnegie Copper-Steel Mine Ties. A wide range of weights and types provide a tie suitable for any condition. Riveted clips eliminate loose parts and special tools. The broad foot and wide bearing surface serve the double purpose of preventing the tie from sinking into soft bottom and crushing on hard bottom. More than half a million Carnegie Copper-Steel Mine Ties are in use today, demonstrating their efficiency and economy.

CARNEGIE STEEL COMPANY • PITTSBURGH
Subsidiary of United States Steel Corporation 137



CARNEGIE ~~COPPER-STEEL~~ MINE TIES

THE MINING CONGRESS JOURNAL

VOLUME 17

MAY, 1931

No. 5

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Practical Operating Men's Department

COAL

*Blower and Tubing for Ventilation on
Double Entry Driving and Special
Rock Tunnel Work*

METAL

The Red Metals Plant

Mining Methods at the Eighty-Five Mines

Published Every Month by The American Mining Congress, Washington, D. C.

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No. 8 of a series of advertisements on "How Superlative Quality is Built into Roebling Wire Rope".

Where **STEEL** gets its **STAMINA**

IT IS in the wire drawing mills that the wire for Roebling "Blue Center" Steel Wire Rope gets much of the toughness and durability for which it is famed.

Here, the wire is cold drawn through steel dies—in and out, again and again. Then at carefully calculated intervals it goes to the tempering furnaces—then back for further drawing. And during every step of this process, additional stamina is slowly and painstakingly "worked" into it.

At Roebling, wire drawing is considered of vital importance. Infinite care is exercised throughout the operation and the methods used are based on years of development. Only highly skilled wire drawers are employed and most of these men have had from 10 to 35 years of experience.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, N. J. *Branches in Principal Cities*

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ROEBLING



"BLUE CENTER"
STEEL

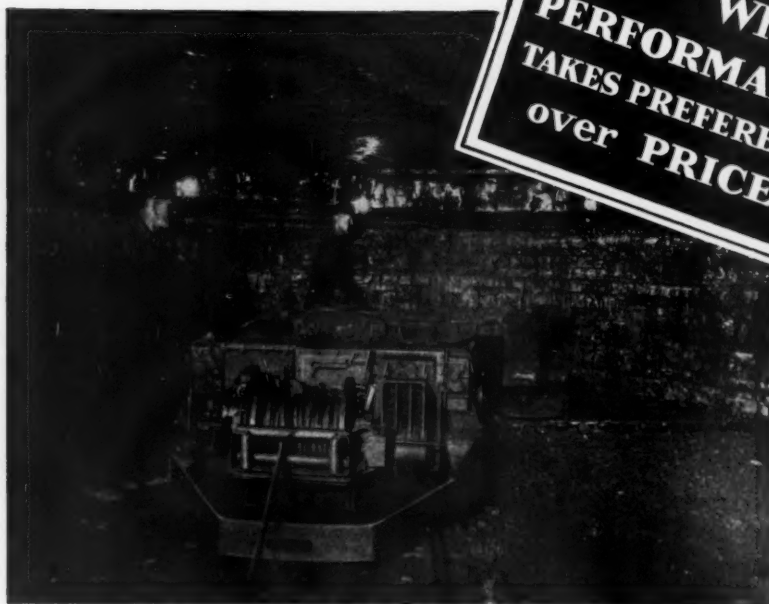
WIRE ROPE

Visit our Booths 408 and 410 at the American Mining Congress Convention and Exposition in Cincinnati, May 11-15.

THE JEFFREY MANUFACTURING CO.

Another prominent user of **SKF**
Bearings in the Mining Industry

Where
PERFORMANCE
TAKES PREFERENCE
over **PRICE**



KEEP MINE EQUIPMENT ON THE JOB WITH SKF

UNDERGROUND giants... biting their way through tons and tons hourly...advancing foot after foot without delay ...and **SKF** Bearings do their part in keeping Jeffrey Coal Cutters on the job. Throughout the mining industry this habit of **SKF** to insure the utmost dependability, above and underground, has made **SKF** Performance take preference over price where production records must be kept up...and bettered.

And with output the prime consideration, **SKF** Bearings

not only do their share of the work but more than that, they do it without calling attention to themselves. Showing no wear after years of service, requiring no adjustments, they reduce electrical troubles, keep motors at their highest efficiency and prolong the life of gears. Fresh lubricant a few times a year ends the maintenance problem. These are the things operators want... these are the things 52 manufacturers in the industry give when they use **SKF** in mining equipment.

SKF INDUSTRIES, INC., 40 East 34th Street, New York, N. Y.

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2677



SELF ALIGNING BALL BEARING



DEEP GROOVE BALL BEARING



DOUBLE ROW DEEP GROOVE BALL BEARING



CYLINDRICAL ROLLER BEARING



SPHERICAL ROLLER BEARING



ALIGNING THRUST BEARING

PROFITABLE

Underground Mechanization

With Any System In Any Mine

The line along which underground mechanization may proceed most profitably in any particular case depends upon thickness of coal seam, impurities, character of roof, and other conditions that influence not only loading and conveying equipment but also cutting and transportation equipment.

But regardless of the system of mining and peculiar local conditions the Jeffrey line of mining machinery offers a complete balanced mechanization service. Jeffrey engineers are in a particularly advantageous position to discuss without prejudice the relative merits of different mining methods, and to offer equipment that is most suitable in any particular case.

The following paragraphs mention briefly the scope of Jeffrey Coal Mine Equipment:

LOADERS

- 44-C Loading Machine: A light, inexpensive and efficient track loader—for any system of mining.
- 40-B Loading Machine: A high capacity track loader.
- 44-L Loading Machine: For loading on long faces directly into a face conveyor.
- 43-A Shortwaloader: A combination cutter-loader for rapid development work.

CONVEYORS

- 57-A and 57-B Sectional Conveyors: Light and easily extended conveyors for rooms and entries.
- 47-A Sectional Conveyor: A large capacity conveyor to handle coal from long faces.
- 49-E Face Conveyor: A rugged sectional face conveyor—any length up to 84 ft.
- 49-G Face Conveyor: A light sectional face conveyor—maximum length 42 ft.
- 49-D Portable Conveyor: A light sectional general utility conveyor—maximum length 28 ft.
- 52-B Sectional Belt Conveyor: High capacity to handle coal from several room or long face conveyors. Any width of belt—any length.
- 52-C Sectional Belt Conveyor: A room conveyor designed to be easily extended with each cut.
- 58-C Pit Car Loader: Two-wheel type, light and inexpensive.
- 38-D Pit Car Loader: Four wheel self-propelled type.

CUTTING MACHINES

- 35-B and 35-BB: Standard Shortwall Machines.
- 35-L Low-vein Shortwall Machine
- 24-B Standard Longwall Machine: Both bottom and top cutting on adjustable skids.

- 36-B Low-vein Longwall Machine: Both bottom and top cutting on adjustable skids.
 - 29-C Standard Arcwall Machine for top, center or bottom cutting.
 - 29-L Low-vein Arcwall Machine for top, center or bottom cutting.
 - 30-A Shearing Machine
 - 29-E Arcshear Machine: For both top and bottom cutting and shearing.
- All cutters made for D. C., A. C., or Air—open and permissible types.

DRILLS AND DRILLING MACHINES

- A-6 Post Drills: Light, easily set up and operated; powerful.
 - 56-A Drilling Machine: For fast drilling, easy handling, and proper placing of shot holes.
- Drills for Mounting on Cutting Machines.

LOCOMOTIVES

- Utility Car: Useful for emergency repairs, and passenger transportation.
- Loading Machine Tender: A compact, powerful locomotive designed especially for shifting cars behind a loading machine.
- Gathering Locomotives: All types—Explosion tested and open cable reel, permissible battery, crab reel, and combination battery and trolley.
- Power Truck: A self-propelled storage battery unit for supplying power to mining machines.
- Haulage Locomotives: Single and tandem units up to 40 tons and larger.

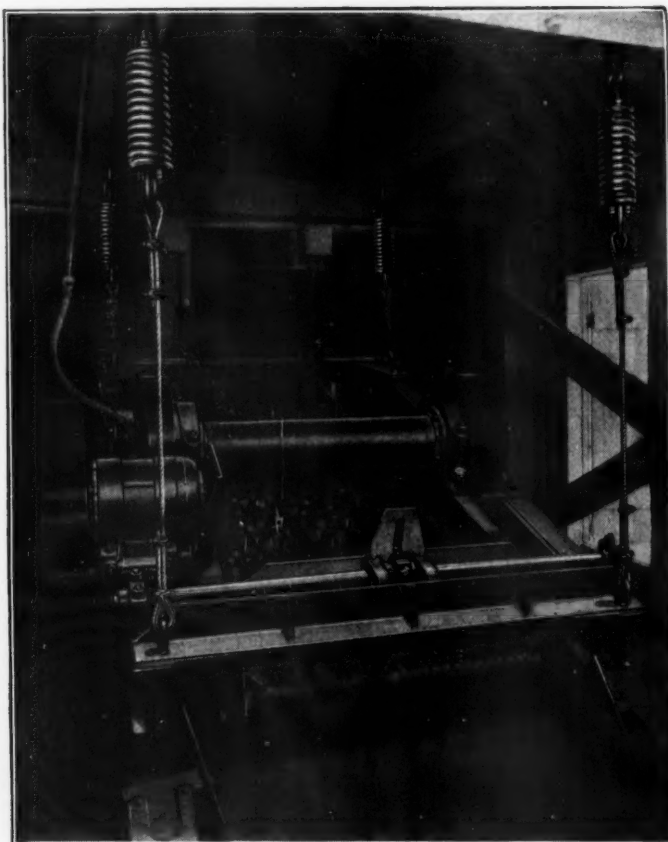
Bulletins covering any or all equipment mentioned above will be gladly sent on request.

The Jeffrey Manufacturing Company

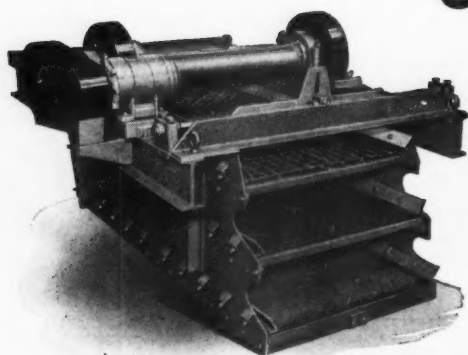
958-99 North Fourth St., Columbus, Ohio

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JEFFREY COAL MINE EQUIPMENT



Positive Mechanically Produced Motion—equal over entire screen surface



Allis-Chalmers vibrating screens are built with one, two and three decks in sizes 3' x 6' and 4' x 8' to suit conditions of operation.

.... The result, large capacity and a clean product. Allis-Chalmers Vibrating Screens have self-aligning, anti-friction bearings with positive dust seals, alemite lubricated; large eccentric shafts; and all rotating parts fitted with safety guards. The vibrating mechanism can be removed without disturbing the screen body or supporting frame. Screen sections are easily changed and are reversible, end for end. They are also interchangeable. The screening angle is adjustable. Centrifugal Vibrating Screens are built with single, double or triple decks. The liberal clearance between decks facilitates spouting and the changing of screen surfaces. . . . Details of construction and other data on vibrating screens are given in Bulletin 1470-A. May we send you a copy?

ALLIS-CHALMERS

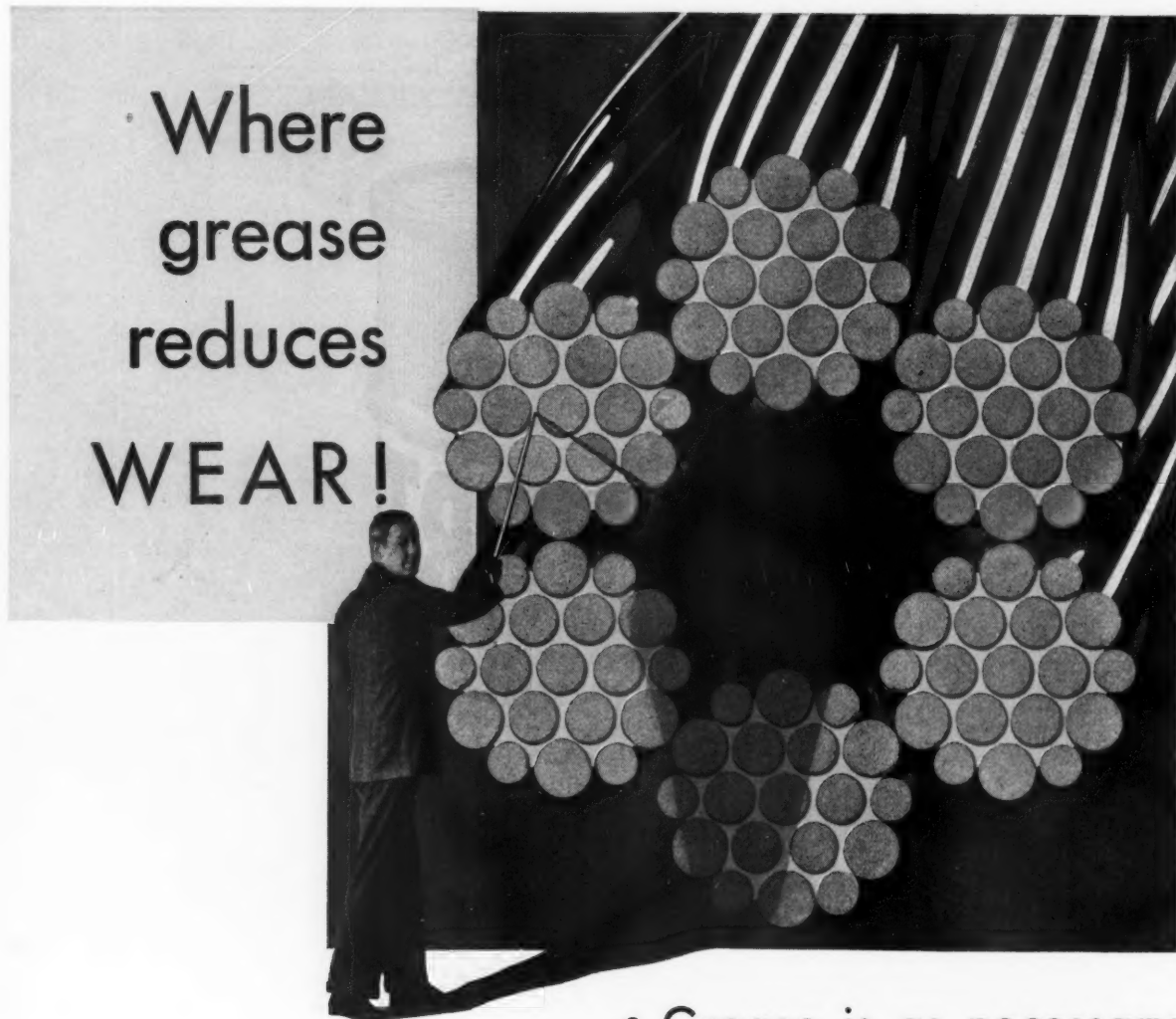
— Allis-Chalmers Manufacturing Company, Milwaukee —



HULBURT OIL & GREASE COMPANY
PHILADELPHIA, PA.

Warehouses throughout the coal fields

Specialists in Coal Mine Lubrication



• Grease is as necessary to a hoisting rope as to the bearings of your motor car. Macwhyte uses the right kind of grease and puts it where it will do the most good.

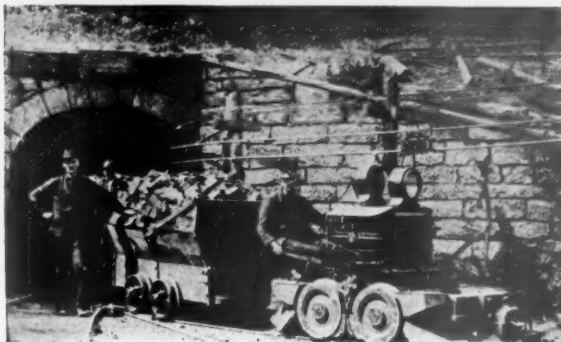
MACWHYTE • Wire Rope

internally lubricated!

NATIONAL PYRAMID BRUSHES

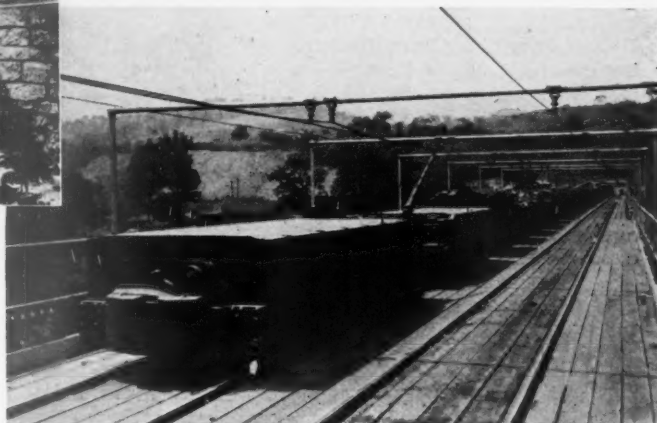


STANDARD FOR 40 YEARS



One of the first mine locomotives manufactured. Built in 1888.

Modern, 40-ton, tandem locomotive for mine haulage.



Industry Depends on Carbon

INDUSTRIAL life today depends on coal—carbon in crude form. Modern coal mining, in turn, depends on carbon in highly refined form—the carbon brush.

Motors equipped with carbon brushes drive the mining machines that cut down the coal, the locomotives that haul it from the mine, the hoists, crushers and conveyors that aid in preparing it for the market.

Mine locomotives have undergone striking development in forty-three years. This is evident from the illustrations on this page. National Pyramid Brushes also evidence marked improvement over the carbon brushes first used. Appearance has undergone little change, but performance has been improved to keep pace with steady progress in the design of electrical equipment.

The raw materials of which National Pyramid Brushes are com-

posed are selected with careful attention to purity and to their influence on performance characteristics of the product. Highly specialized equipment has been developed for calcining these raw products and milling them to a fine flour; for thorough mixing and blending; for moulding into blocks of homogeneous structure; and for baking under close temperature control.

Better commutation, lower friction, elimination of abrasiveness, increased carrying capacity, adaptability to higher speeds and the ability to withstand severe service conditions have been attained through extensive research, improvement in manufacturing

facilities and the cumulative experience of forty years.

There are sound reasons for the leadership of National Pyramid Brushes.

CARBON

In graphitic form, carbon is a lubricant. This characteristic has been utilized in the development of GREDAG, a blend of PURE Electric Furnace Graphite and high quality grease. GREDAG establishes a firmly adhering film of lubricant that INSURES LUBRICATION. Let GREDAG reduce your lubrication costs.

Visit Our Booth, No. 301, at The American Mining Congress Convention and Exposition

NATIONAL CARBON COMPANY INC.

Carbon Sales Division / Cleveland, Ohio

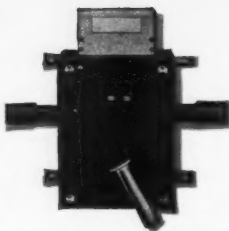
Unit of Union Carbide  and Carbon Corporation

BRANCH SALES OFFICES: / NEW YORK / PITTSBURGH / CHICAGO / SAN FRANCISCO

ATTUNED to the PURPOSE OF THIS YEAR'S

Are You Familiar With The Story of This Device?

Do you know O-B Circuit Breaker Switches are being used to control peak power demands, thus avoiding wasteful power charges? Then, too, it is interesting to learn how locomotive armatures are assured protection by this device. The story of this switch is recommended to the consideration of all serious minded executives.



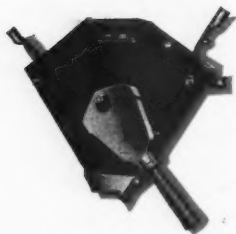
This Will Catch and Hold Your Interest

Damage to motors which would total thousands of dollars is avoided by the positive protection afforded by O-B Automatic Motor Starters. Thousands of needless restarting-steps are likewise saved by the automatic control feature. Perhaps this performance could be duplicated on your property.



Something New

The chief electrical engineers and safety directors of a large coal corporation were the sponsors of the New O-B Safety Switch. Today it is protecting hundreds of men who must disconnect heavily loaded D. C. circuits. A blow-out coil extinguishes the arc. The switch is quick-make as well as quick-break. Something that surely warrants investigating.



MANY mining men are going to the Cincinnati meeting this year with the sincere purpose of increasing their abilities to meet the pressing problems of their everyday work. They recognize that today's acute business conditions provide many questions which require the counselling of others, the points of views of others, if intelligent answers are to be found. In the meetings of this yearly experience exchange and on the floors of the convention exhibits, the sincerely interested mining executive may find much to help him in today's great problems, in rising to meet today's great opportunities.

The O-B Exhibit has been planned to meet such mining men on their own ground, to assist them in securing correct answers to their problems. If you are interested in added safety to men and machines, you will find safety devices at this display which return rich rewards. If you are interested in securing large returns on a small investment, you will find devices and materials that give your sense of values a pleasant shock when you learn how little they cost in proportion to the results they produce. Therefore, it is believed a great many will find the O-B Exhibit to be one of the most interesting displays of the convention. So come and spend a profitable half hour or more at spaces 412-513.

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Company Limited, Niagara Falls, Canada

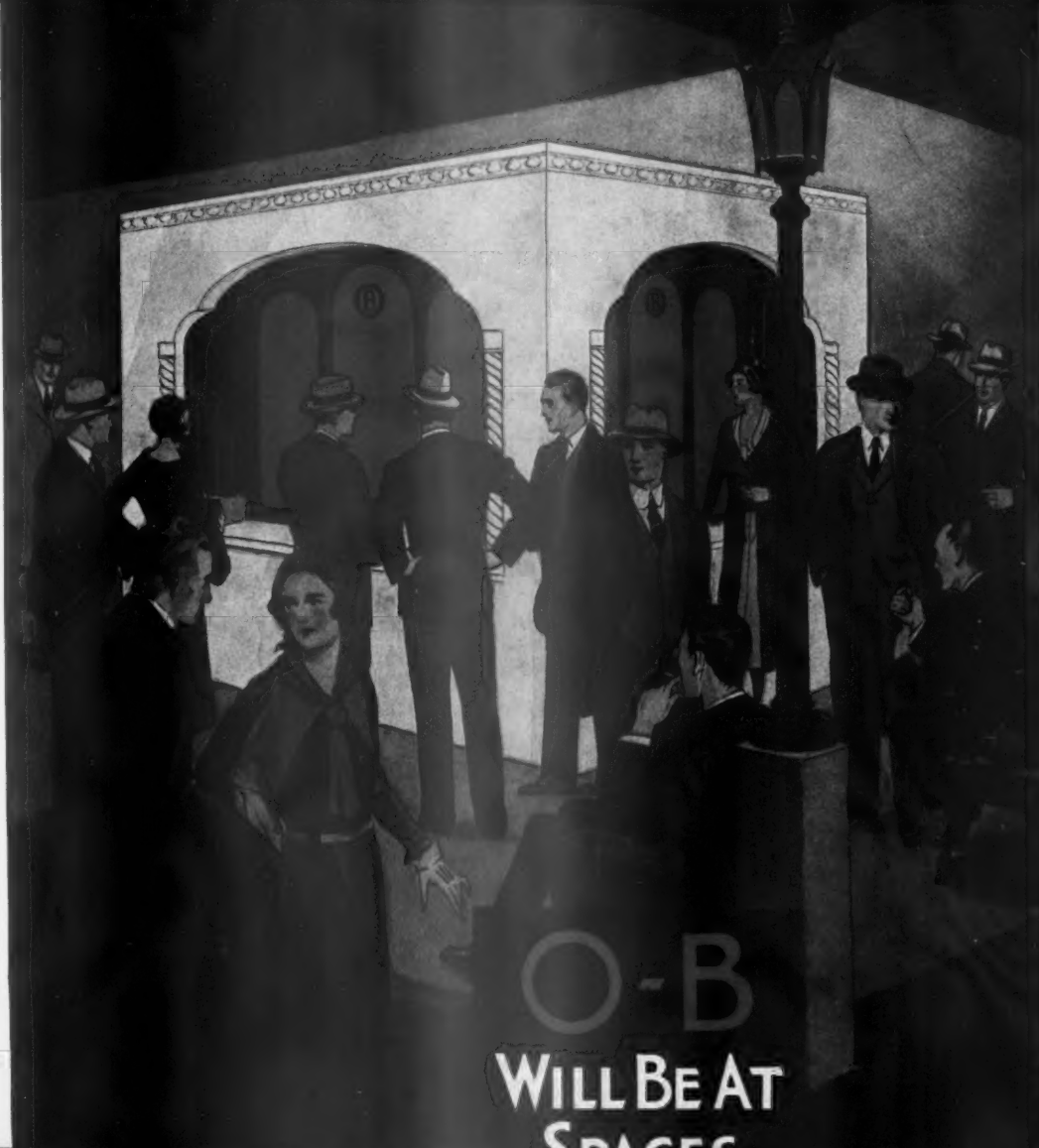
1415M



Lessens the Danger of Gas

Because the O-B Fused Trolley Tap has demonstrated its ability to save armatures from overloads, to protect trailing cable, and to minimize the chances of motor trouble igniting face-gas, this tap has received a hearty welcome in every field. There is worthwhile expense-saving opportunity in this device for those who care to avail themselves of its advantages.

CONVENTION



O-B
WILL BE AT
SPACES
412-513

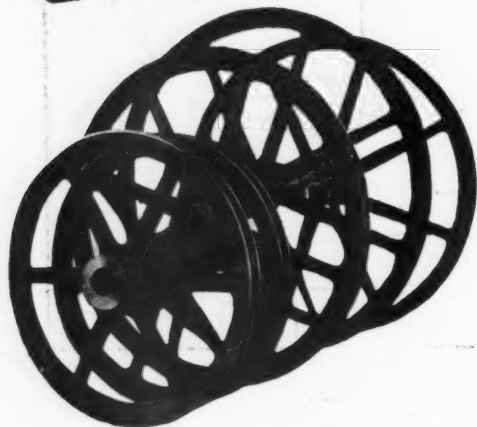
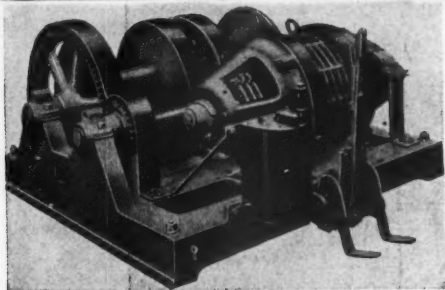
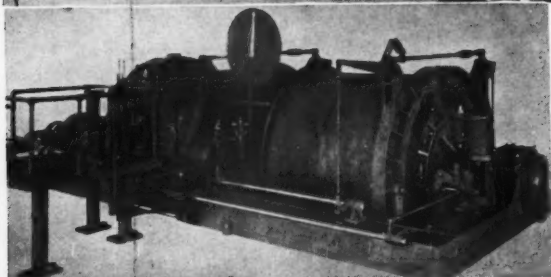
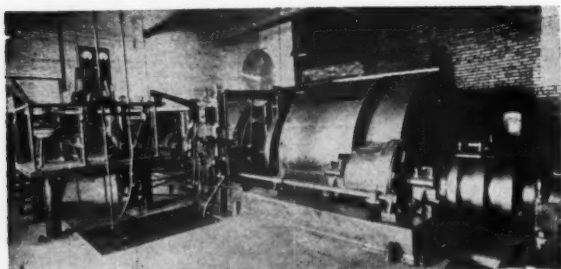
Ohio Brass Co.

NEW YORK PITTSBURGH
PHILADELPHIA BOSTON



CHICAGO CLEVELAND ST. LOUIS ATLANTA DALLAS
LOS ANGELES SAN FRANCISCO SEATTLE

PORCELAIN
INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING
MATERIALS
VALVES



Where does the

ADAPTABILITY, efficiency and reliability—and the greatest of these is...? Put the emphasis where you will, Vulcan equipment is designed to meet your requirement. It is backed by over 80 years experience in building mining machinery for use in all parts of the world. Advanced engineering practice, high grade materials and careful workmanship have enabled Vulcan engineers to meet the exacting requirements of the many mining fields. From these high standards and a widely varied experience have been built for Vulcan a world-wide reputation for equipment that meets all demands put upon it.

Vulcan hoists are built for the heaviest duty at mine shafts and include a complete line of room, scraper and self-contained hoists.

Vulcan builds a locomotive exactly fitted to your needs. Their complete line of haulage equipment includes steam, gaso-

VULCAN

emphasis belong?

line, gas-electric, oil-electric, electric trolley, storage battery locomotives and larry cars.

Vulcan coal crushers are carefully designed for most economical preparation. They are simple and rugged.

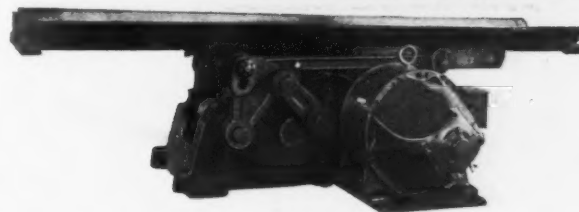
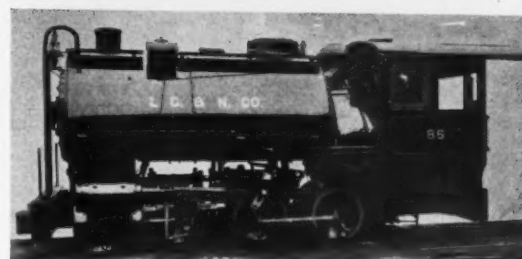
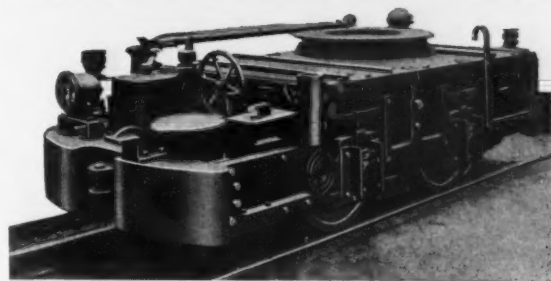
Vulcan fans are built in all sizes to meet all ventilating requirements. Our special catalog describes them and pictures many different installations.

Vulcan shaking conveyors are built in three sizes, in the open and enclosed types, enabling us to offer a unit proportioned correctly in size and price for any job. They are rugged, easily handled and low in first cost and maintenance.

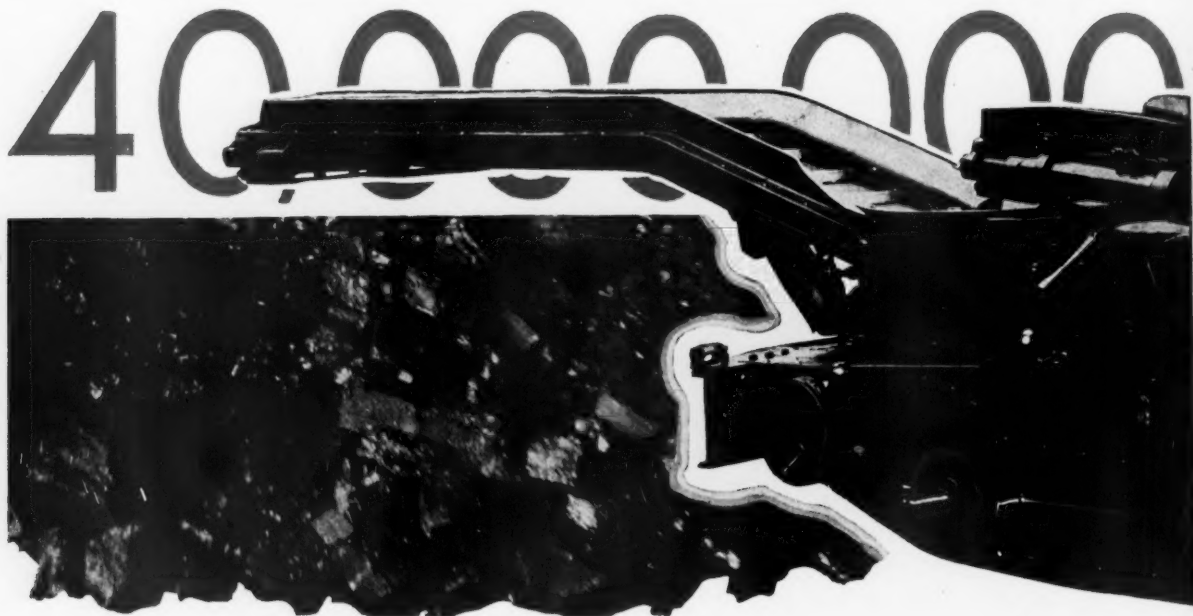
Cast steel sheave wheels, cages, herringbone gears and special castings are other Vulcan products of interest to mine operators.

Let us send literature descriptive of any of this material in which you are interested.

VULCAN IRON WORKS
WILKES-BARRE, PENNA.



COAL MINING EQUIPMENT



THE tremendous tonnage loaded by these machines is convincing proof of their efficiency, their operating economy, and their all around adaptability to mining conditions. They are completely mechanical in operation. They provide an uninterrupted stream of coal at two tons or more per minute. All operations are controlled by one man. These



The JOY 7-BU brings the advantages of completely mechanical loading to low coal. It will operate in a 48-inch seam. Same capacity and control as the larger machine.

Visit our Booths 430-434

at The American Mining Congress Convention and Exposition, in Cincinnati, May 11-15

tons loaded last year



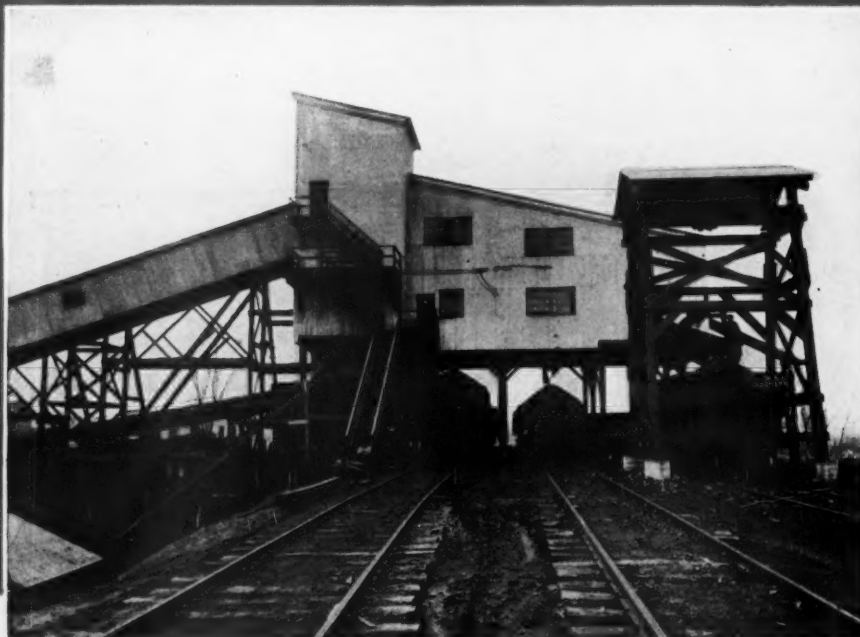
loaders are flexible, they move on or off track, and they shift quickly from place to place.

Shown above is the JOY 5-BU. See this machine, that has cut such a wide swath in loading history, at the Cincinnati Exposition. Or let us tell you of installations near you. We will be glad to send you descriptive literature or to give you an estimate of the possibilities of Joy loading at your mine.

JOY MANUFACTURING CO.

FRANKLIN, PENNA.

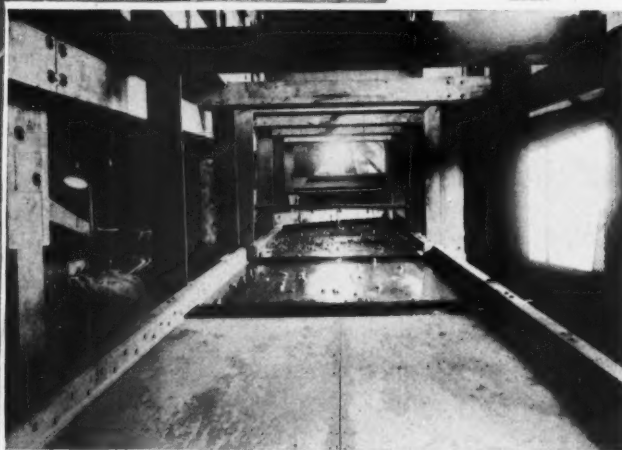
JOY
LOADERS



An exterior view of the Ingle Coal Company's new RandS Tipple and Washery at Littles, Indiana.



The Twin Tandem Hydro-Separator cleans 125 tons of 3" screenings per hour.



An RandS Dewatering Screen is used for making three sizes of coal, 4" x 2", 2" x 1 1/4" and 1 1/4" screenings.

The newest Hydro-Separator, the Twin Tandem, with all steel enclosure, is presented here. This installation, one of several recently made, is at the Ingle Coal Company, Littles, Indiana.

This plant, RandS throughout, is of 150 tons per hour, R.O.M. capacity. No. 5 seam coal in four popular sizes is produced, lump, 4" x 2", 2" x 1 1/4" and 1 1/4" screenings.

One hundred and twenty-five tons per hour of 3" screenings are washed and separated in the Twin Tandem Hydro-Separator and screened into three sizes over an RandS Dewatering Screen.

This mine is completely mechanized, including coal preparation equipment. Learn more about it at the Convention.



A plan view of the new RandS Washing Plant of the Big Vein Coal Company, Buckskin, Indiana.

**MEET US
AT BOOTH
509**

A perspective wash drawing of the Twin Tandem Hydro-Separator, showing details of operation and flow of coal and refuse.



The RandS coal washing addition to the Buckskin Mine of the Big Vein Coal Company, at Buckskin, Indiana, is another recent installation of the new Twin Tandem Hydro-Separator. Here the hydro battery consists of two primary cells, two secondary cells and one refuse rewash cell. One hundred and twenty-five tons of 2" screenings are cleaned per hour.

Five sizes and combinations of each, 4" lump, 4" x 2" egg, 2" x 1 1/4" stove, 1 1/4" x 3/4" nut and 3/4" x 0" slack, are produced. A double RandS Draining Screen is used for sizing and dewatering all sizes larger than 3/4" x 0". The 3/4" x 0" coal is sized and dewatered over an Arms Vibrating Screen, the 1/4" x 0" being sluiced into a battery of two 2 cell classifiers, overflow going

over 4 wet concentrating tables and then over an RandS Dewatering Screen, from which it is elevated to a centrifugal drier.

Apron booms are used for loading on two tracks, slack being chuted on another. Bone pickings from the picking tables are crushed and returned to the washing system.

The Hydro-Separator Systems illustrated and described here are only two of many possible combinations of this superior separating and washing equipment. Let us tell you how to apply it in your plant. Write for detailed information or see us at Booth 509, American Mining Congress, Cincinnati, May 11 to 15.

ROBERTS AND SCHAEFER CO.
ENGINEERS and CONTRACTORS

PITTSBURGH, PA., 418 OLIVER BLDG. WRIGLEY BUILDING, CHICAGO HUNTINGTON, W. VIRGINIA, 514 NINTH AVE.

For shooting *more* lump



coal economically, use *du Pont Explosives!*

DU PONT now has a complete series of Permissibles and a complete series of Pellet Powders. Whatever the type of coal seam—whether your mine is gaseous or non-gaseous—you can use du Pont Explosives with assurance of satisfactory execution and secure good lump coal with economy in operation. Below is a list of the popular du Pont Permissibles and du Pont Pellet Powders.



PERMISSIBLE EXPLOSIVES

The safest agent for blasting coal and rock in gaseous and dusty coal mines.

Monobel No. 8. 145 cartridges, $1\frac{1}{4}$ " x 8", to the 50-lb. case. A strong Permissible of medium velocity adapted for producing lump coal in hard-shooting high seams where only one row of holes is used. Strong enough to break rock or slate bands and slow enough to prevent shattering of either the coal or the binders.

Gelobel No. 3. 95 cartridges, $1\frac{1}{4}$ " x 8", to the 50-lb. case. A gelatin Permissible especially formulated for rock work in coal mines. Highly water resisting and hence useful for wet holes in either rock or coal.

Duobel. 140 cartridges, $1\frac{1}{4}$ " x 8", to the 50-lb. case. A medium density Permissible of wide adaptability. By varying the size of the cartridge and the method of loading and tamping, it can be used satisfactorily in thin seams as well as thick seams, and in solid coal as well as machine coal. It is fast enough to shear the coal from the ribs, but its bulk lowers the strength of the properly gauged charge enough to prevent shattering.

Monobel No. 9-A. 160 cartridges, $1\frac{1}{4}$ " x 8", to the 50-lb. case. A strong, slow explosive of medium density. Causes comparatively little shattering around the bore hole, and has a wide, spreading action which makes a high percentage of lump in medium hard-shooting coal regardless of the thickness. Especially adapted for seams of

coal without heavy rock binders, and also for seams where a very tender roof overlies the coal.

Monobel No. 12. 225 cartridges, $1\frac{1}{4}$ " x 8", to the 50-lb. case. A very bulky Permissible, which has proved excellent for making coarse coal in low seams and thin benches where the seam is cut in the center; also in thicker seams where the coal is clean and not very hard. Breaks slate or bone binders in low seams into large pieces easy to separate from the coal.



PELLET POWDERS

For use in non-gaseous and non-dusty mines. Safer than granular blasting powder, more convenient to handle and more water resisting. Makes much less smoke, gives better execution and lower cost.

Pellet Powder No. 1. 105 cartridges, $1\frac{1}{4}$ " x 8", to the 50-lb. case. A fast Pellet Powder suited especially for blasting open coal and soft coal containing streaks of bone. Economical because of the greater number of cartridges to the case.

Pellet Powder No. 2. 96 cartridges, $1\frac{1}{4}$ " x 8", to the 50-lb. case. A Pellet Powder of medium speed adapted for general use in relatively easy-shooting coal.

Pellet Powder No. 3. 96 cartridges, $1\frac{1}{4}$ " x 8", to the 50-lb. case. A new, slow Pellet Powder developed especially for blasting hard, blocky coal. Gives as good results in solid shooting as the larger granulations of blasting powder.

E. I. DU PONT DE NEMOURS & COMPANY, Inc.
Explosives Department *Wilmington, Delaware*



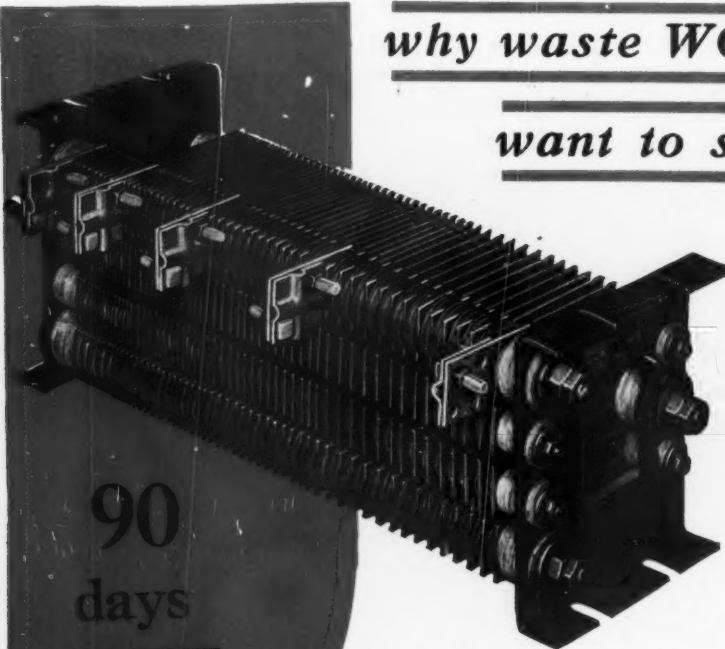
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VISIT BOOTHS 209-211

MAY 11th — MAY 15th

COAL MINING EXPOSITION IN CINCINNATI, OHIO

*why waste WORDS when all we
want to say is "TRY 'EM"*



90
days
FREE
TRIAL

P-G Homanite Steel Grids

are built especially for the hard surface encountered in mines—where conditions call for an unbreakable resistance—one that is not affected by vibration or dampness. Every P-G GRID is GUARANTEED for twelve months from date of shipment. You are assured of satisfactory service—get one for your toughest resistance problem. A ninety-day free trial is yours for the asking.

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Distributors

Reduction in Bearing Wear
Lower Labor Cost
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More details and offer of
service await your inquiry.

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Absolute safety, unusual compactness and entirely automatic control, these are three of the foremost features of this essential safety equipment. Remove trolley pole from wire and attach cable nip—that's all there is to do. And thirty days free trial to test it.



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The Post - Glover Electric Co.

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SEE
BOOTHS
213-215



Meeting Modern

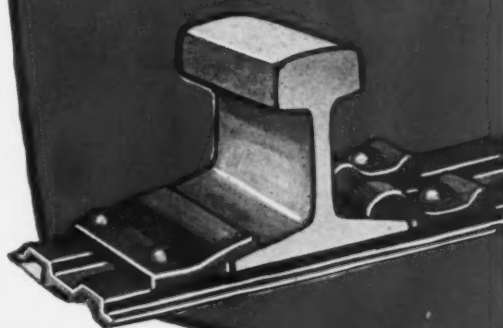
We can offer many short cuts to track improvements. Riveted and solid frogs of designs protective to men and to equipment. Split switches and turnouts of every design. Switch Stands; Plain and "Kick-Switch" Plates; Crossings; Portable Turnouts that can be quickly laid without cutting rails—especially handy for mechanical loading; Portable Track, complete steel turnouts and Shinkle Jumpers.



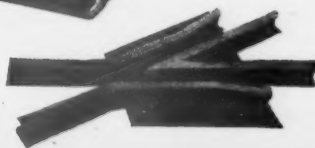
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Mine Ties for every purpose including the Hunt — West Virginia Balling Tie which offers special advantages in advancing room work. Our special and standard equipment is so clearly presented in our Catalog "C" that we would like to put it in the hands of every one interested in track work. Write for your copy. Large track stock carried for immediate shipment.



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AHLBERG Ground BEARINGS

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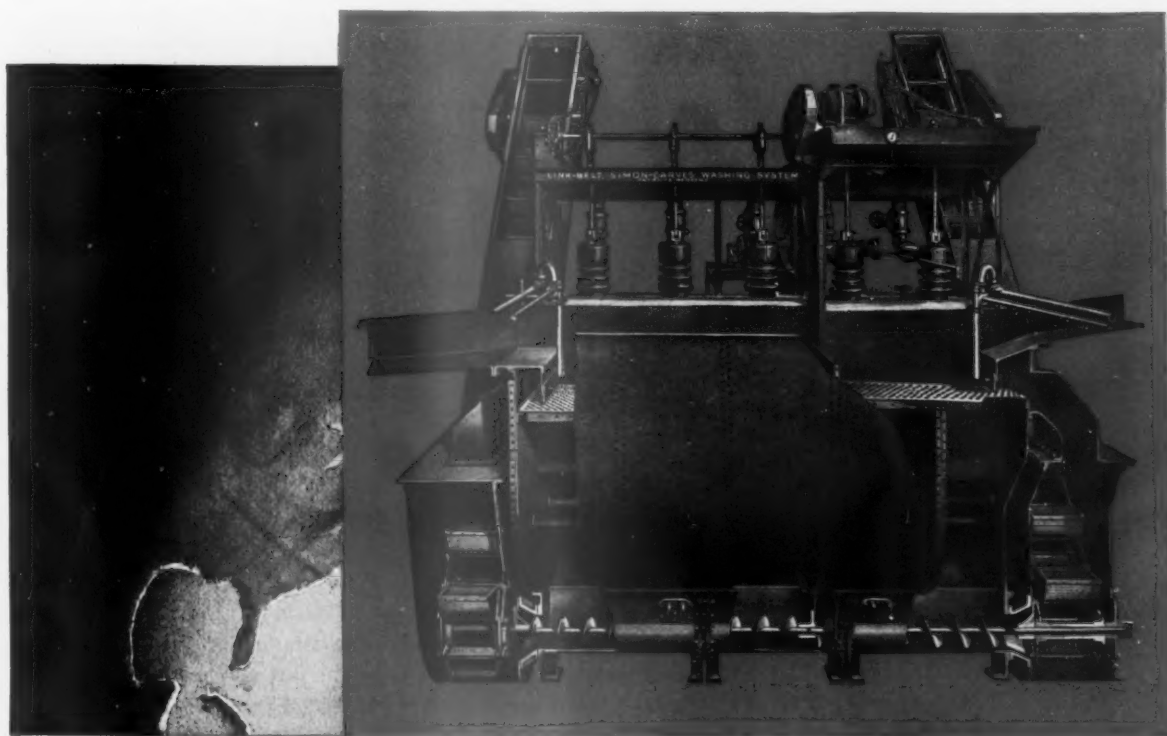
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AMERICAN MINING CONGRESS
CINCINNATI

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Geo. Klein Armature Works, Centralia, Illinois
Mine Service Company, Lothair, Kentucky
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CLEANS the COAL of the WORLD

The Universal System Over 60,000,000 Tons Annually

190 Simon-Carves washing plants have been built for service all over the world. In Great Britain, France, Spain, China, South Africa, Canada, United States, practically wherever coal is mined.

The Simon-Carves System was originally developed in Great Britain, where it has now come into almost general use. Some of the earlier installations (using the original design) in that country have been in continuous operation for over 25 years. The last two years have seen even greater improvement in design over the original system.

Since its introduction in the United States by Link-Belt, its adoption by American operators has been rapid. In less than three years, plants have been put into operation in West Virginia, Ohio, Indiana, Pennsylvania, Missouri and other fields; some of these plants are being sold as repeat orders. Most recent is the entry of the system into the anthracite field. Let us tell you what is being accomplished by these installations.

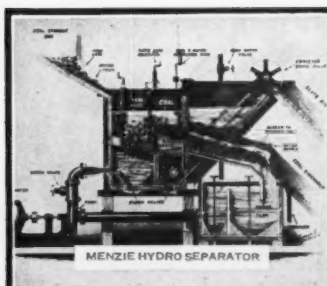
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Complete Equipment for the Handling, Preparation and Washing of Coal
CHICAGO, 300 W. Pershing Rd. PHILADELPHIA, 2045 W. Hunting Park Ave.

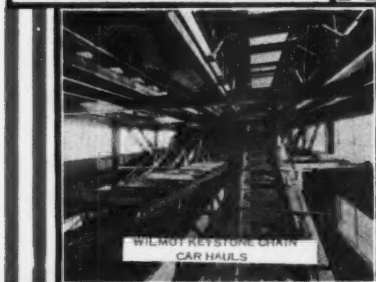
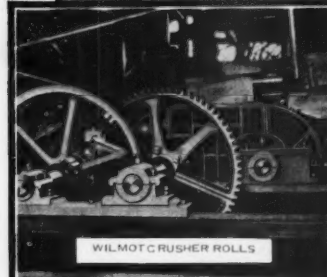
LINK-BELT

SIMON-CARVES COAL WASHERIES

VISIT OUR EXHIBIT, BOOTHS 307-309, AMERICAN MINING CONGRESS, MUSIC HALL, CINCINNATI, MAY 11-15



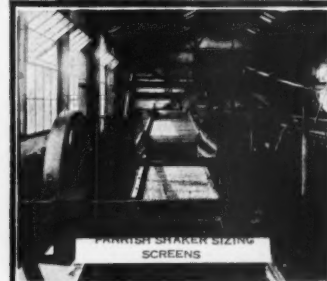
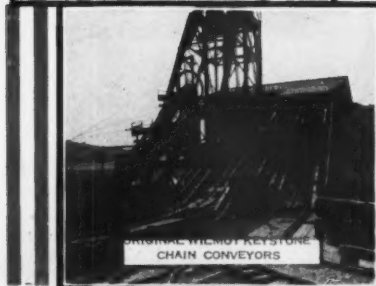
MENZIE HYDRO SEPARATOR

WILMOT RIVETLESS KEYSTONE
CAR HAULS

WILMOT CRUSHER ROLLS



WILMOT SIMPLEX JIGS

FANNING STAKER SIZING
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CHAIN CONVEYORS

WILMOT COAL CLEANING CONVEYING CRUSHING EQUIPMENT

TO the progressive modern operator of 1931 who knows mining equipment from drill to tippie, the Wilmot Engineering Company offers a complete line of COAL CLEANING AND HANDLING EQUIPMENT unsurpassed in the industry today. The product of over 20 years' specialized and successful experience in Designing and Manufacturing Coal Machinery . . . of over 20 years' research, testing, development and improvement . . . WILMOT EQUIPMENT today as in the past, is serving mines among the foremost in America.

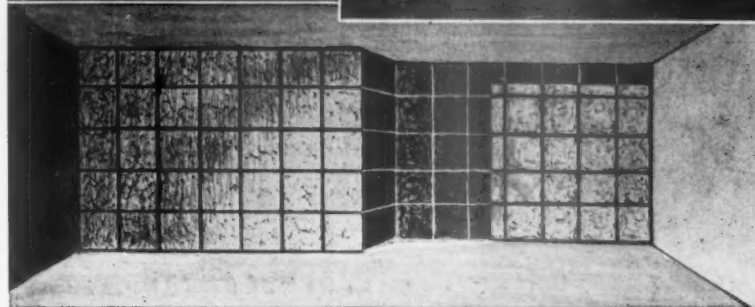
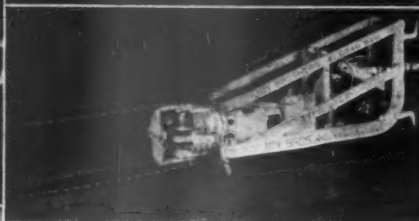
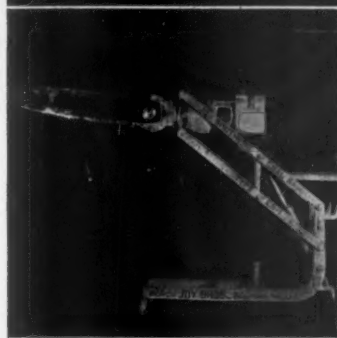
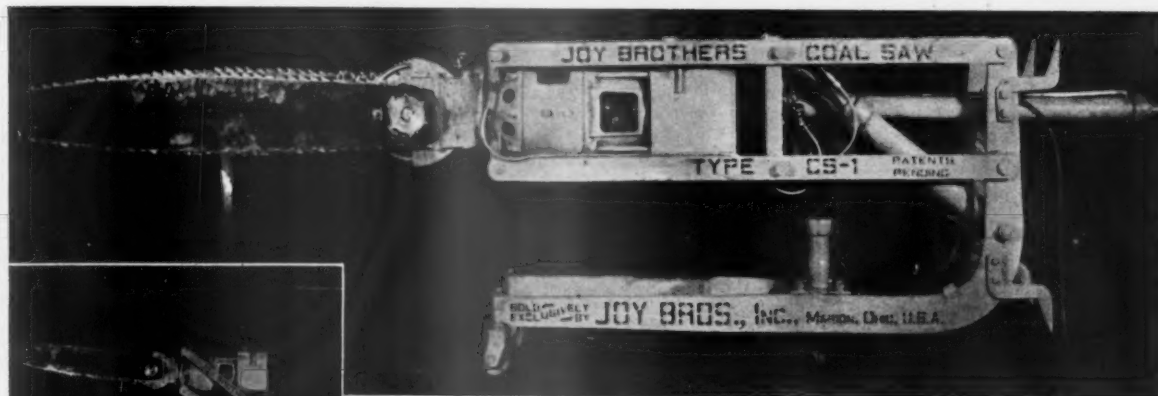


If you use or need either Conveying or Elevating Machinery, Crushing Rolls, with Johnson Hollow Ground Teeth, Screens, Coal Cleaning Plants, Jigs, Hydro Separators, Original Wilmot Rivetless Keystone Chains, Chain Attachments, Picking Tables, or Miscellaneous Breaker Machinery such as Gears, Shafting, Sprockets, etc., WILMOT Quality EQUIPMENT merits your most careful consideration. WILMOT Engineers likewise are always at your service and will gladly discuss with you any of your Preparation or Hauling difficulties, investigate means of correcting them, and submit their recommendations to you. No obligation. Let us hear from you.

WILMOT ENGINEERING COMPANY

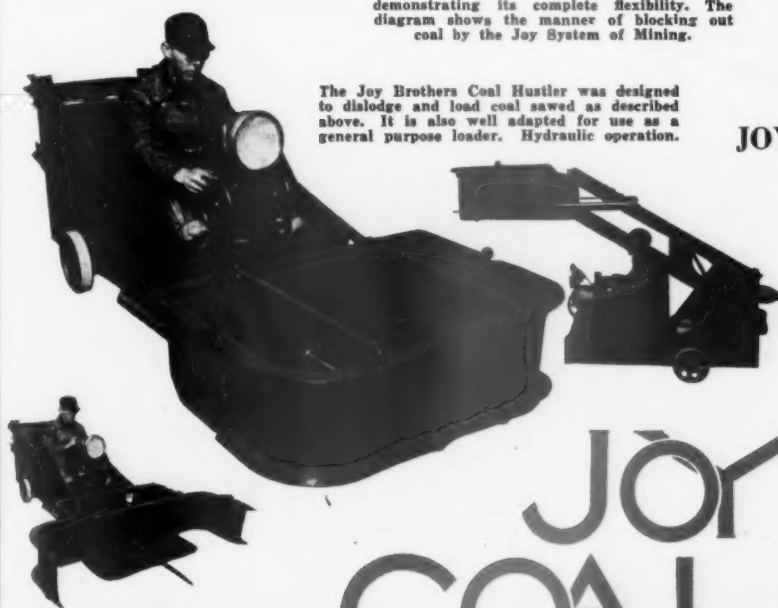
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REVOLUTIONARY today—

Three views of the Joy Brothers Coal Saw demonstrating its complete flexibility. The diagram shows the manner of blocking out coal by the Joy System of Mining.

The Joy Brothers Coal Hustler was designed to dislodge and load coal sawed as described above. It is also well adapted for use as a general purpose loader. Hydraulic operation.

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THIS revolutionary equipment permits the production of completely controlled coal sizes. It offers the advantages of a tremendously simplified cycle of operation and continuity of effort at the same time greatly reducing the hazards of coal mining. Coal is sawed into blocks of predetermined sizes and dislodged from the face by hydraulic pressure pads. The Coal Saws eliminate undercutting machines, coal drills and explosives. Write for descriptions of this revolutionary coal production equipment. You will see it at Booth 601 at The American Mining Congress Convention and Exposition.

JOY BROS., INC., Marion, Ohio

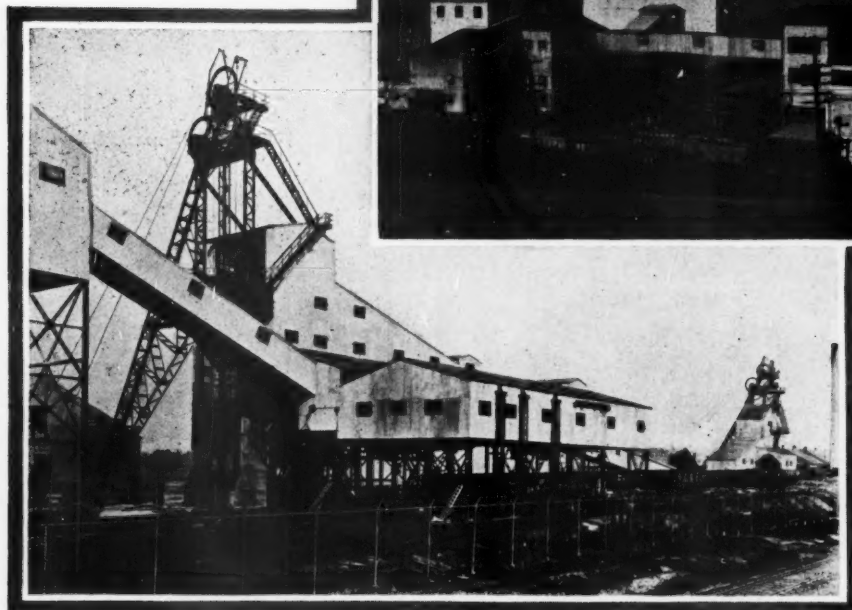
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Booth 601

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20 years



*of
intensive
experience*

is behind

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ALLEN & GARCIA SERVICES
cover the entire field of coal mining, also rock salt, fluorspar, phosphate, etc.

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Our plants are well known for their structural and mechanical perfection, and low maintenance cost.

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DESIGNING · CONSULTING · CONSTRUCTING · TIPPLES · WASHERIES

OF MODERN COAL OPERATIONS
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Leschen Aerial Wire Rope Tramways are economical carriers of coal, ore and mine waste. Our Catalog No. T-26 gives full particulars.

For the Biggest Hoist In the World

This reel contains 10,450 feet of $1\frac{1}{2}$ inch diameter "HERCULES" (Red-Strand) Wire Rope for the No. 2 shaft of the Quincy Mining Company. The Nordberg hoist on which this wire rope is to be used is of the double cone type, having a maximum diameter of 30 feet, and it is said to be the largest hoist in the world.

Made Only by

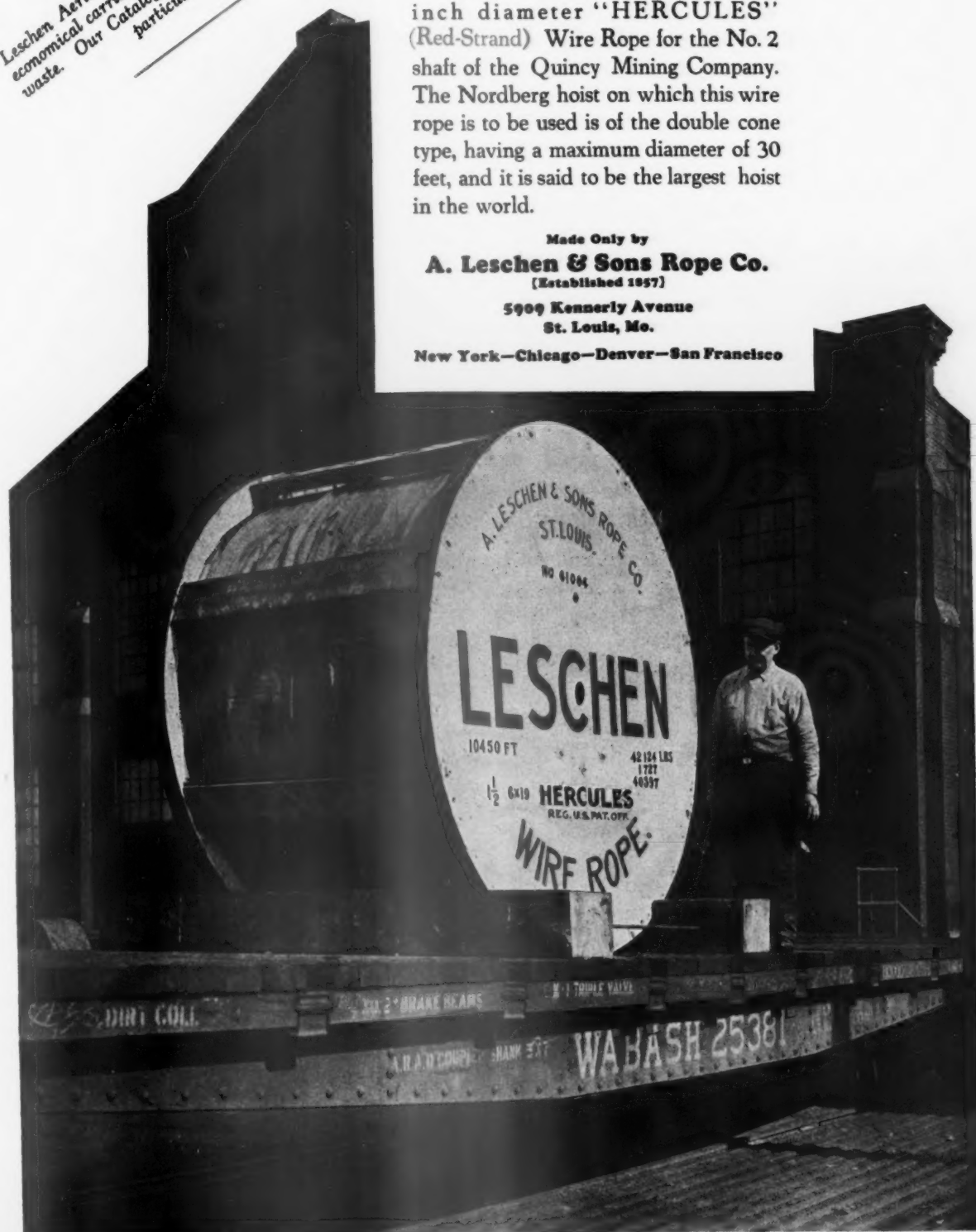
A. Leschen & Sons Rope Co.

(Established 1857)

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New York—Chicago—Denver—San Francisco

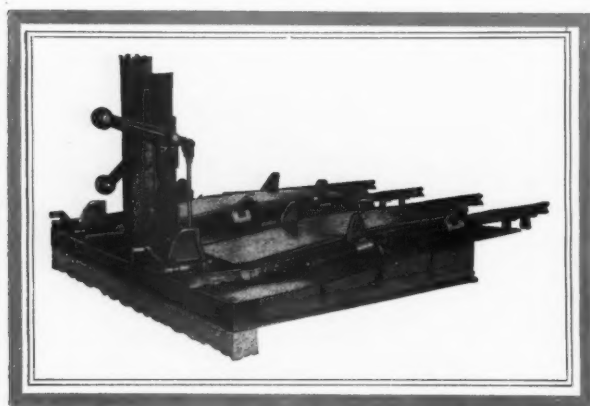


1909 **NOLAN** 1931

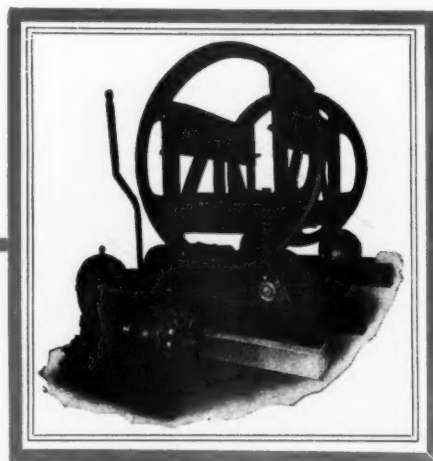
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Practical Suggestions for Speeding Car Handling

YOUR car handling can be speeded, made automatic with increased safety. Ways and means to improve handling include caging, dumping, feeding to cages or dumps, automatic switching and retarding or pushing cars. Through twenty-two years intensive experience with just these problems we are able to offer many practical suggestions. The increasing demand for speed and tonnage can be met at many critical handling points by Nolan equipment. Our engineers will survey handling problems at your mine and will submit practical plans for their solution without obligating you. Let us send descriptive literature about our simply designed and rugged handling devices. You will find helpful suggestions.



Automatic Cushion
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"Pre-Admission"
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Bumper Stop Safety



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For

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The American Mining
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See the model of the new
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TWENTY-TWO YEARS EXPERIENCE IN THE DESIGN AND
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The MINING SAFETY DEVICE Company

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SAVE 20% TO 50%
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The "WHALEY" AUTOMAT



THE "WHALEY AUTOMAT"



WHALEY AUTOMATS have proved that even in periods of great depression mechanically loaded coal can be produced at a profit—they are reducing labor costs 20% to 50%. Their efficiency has been proved in both tonnage loading and development work.

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MYERS-WHALEY COMPANY.

KNOXVILLE

Incorporated 1908.

TENNESSEE

Modern Mining Demanded a New Coal-Loading Method



CLARKSON *has produced it!*

The old methods were good, but not good enough. The industry's ancient plea, "Still more tonnage at still less cost," has never ended.

But this is the plea that the new CLARKSON LOADER has answered at last—and answered with a *new* mechanical principle, a *new* refinement of design, a *new* smoothness of operation and a *new* economy of maintenance so unusual as to present an entirely *new* conception of high speed coal loading efficiency!

Think of steady, dependable, unfailing, performance like this . . . one-man control . . . 2-ton-a-minute capacity . . . hand-loaded selectivity . . . at the operating expense of a cutting machine! Where—else—where—can you find such a combination as this?

And these are just a few of the many CLARKSON LOADER facts that definitely establish this wonderful machine as your one, your only . . . your preferable . . . choice, *if* you're interested in increasing your production profits to the greatest possible degree.

They are facts, however, made possible only by such exclusively "CLARKSON" features as the new CLARKSON type of Steel Frame Construction; the new CLARKSON Belt Conveyor System which now makes obsolete, old-fashioned chains; the new CLARKSON Adjustable Digging Head which, among other things, eliminates Set Down Shot difficulties; and the new CLARKSON-style Heavy Duty Steel Wheels and Axles!

But we'd like very much to send you the complete NEW CLARKSON story. May we? Write us now!



CLARKSON MANUFACTURING CO.

NASHVILLE, ILLINOIS

Cutting . . . Loading . . . Hauling



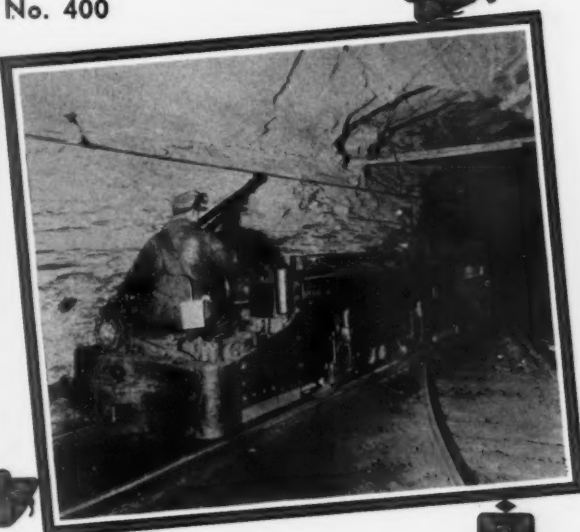
Safely and Efficiently

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**EDISON
MINE
LAMPS**

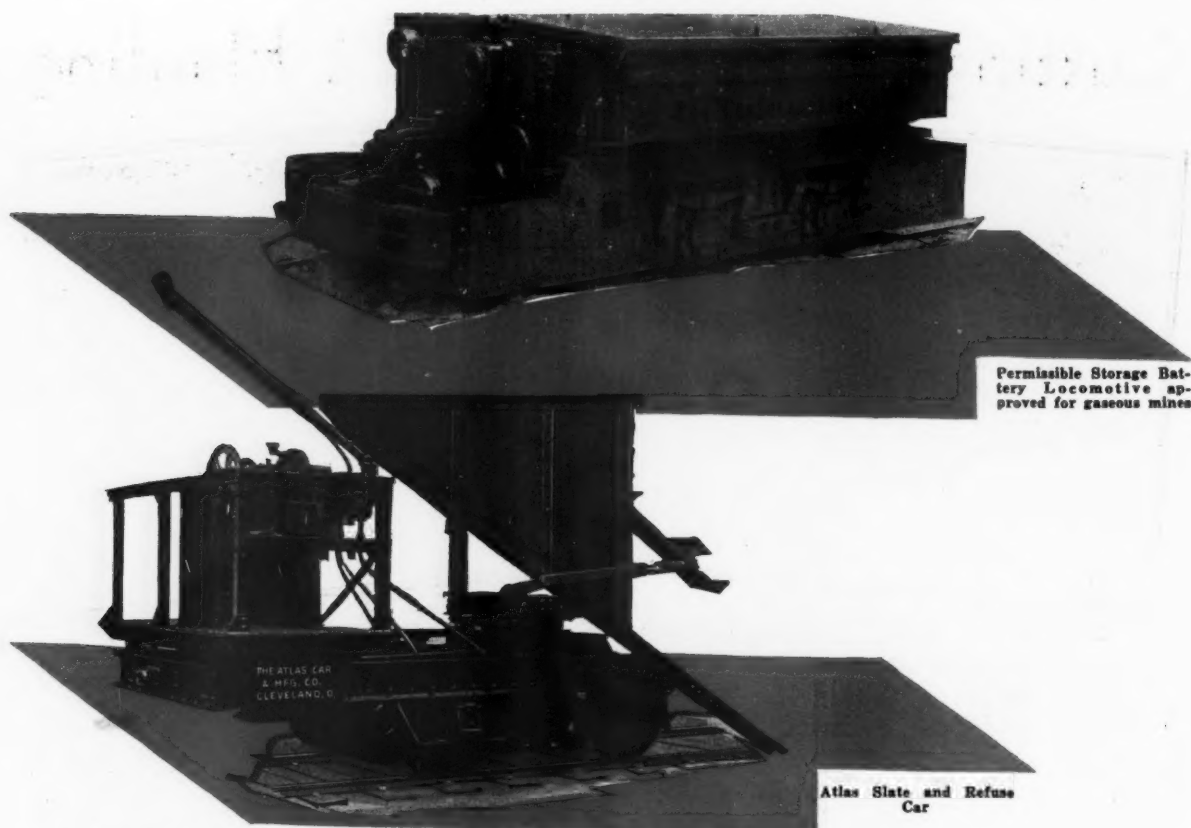
See these universally used
Edison Mine Lamps and
Other M-S-A Products at
Cincinnati, May 11...15th.

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BOOTH No. 400



Mine Safety  *Appliances Co.*

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Permissible Storage Battery Locomotive approved for gaseous mines

Atlas Slate and Refuse Car

ATLAS HAULAGE EQUIPMENT

Assures Lower Haulage Costs

Atlas Locomotives have made remarkable records in full day operation without a battery change under most severe conditions. Slate Car maintenance is exceptionally low due to husky construction and careful design. Consult Atlas for longer life equipment and lower haulage costs.

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Storage Battery Locomotives

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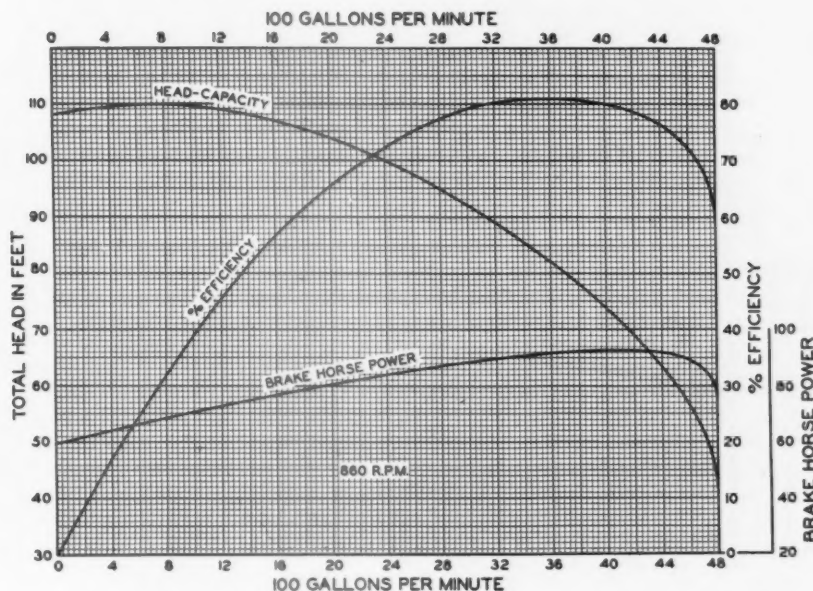
Atlas Indicating and Recording Scale
Mechanism for Weighing Scales on
cars and hoppers

The ATLAS CAR & MANUFACTURING COMPANY
Engineers **CLEVELAND, OHIO** *Manufacturers*

ANOTHER EXHIBITION

OF BARRETT-HAENTJENS "BETTER PUMP PERFORMANCE"

THE HAZLETON SLUDGE-PUMP



The above chart graphically illustrates the remarkable performance of Barrett-Haentjens' latest contribution to mining economy — the HAZLETON SLUDGE PUMP—81% efficient when handling 3,600 G. P. M. of clean water against an 82 ft. head! Study this chart very carefully. You'll find it an interesting story. Note the steep head-capacity curve. Note the efficiency of 75% or better at from 2,600 to 4,500 G. P. M. Note the flat horsepower curve showing the impossibility of overloading the motor at reduced head. Note the 30% greater pressure when shut off than at best efficiency, indicating the powerful reserve push available for clearing blocked lines.

This is Sludge-Pump PERFORMANCE!

Like all other Barrett-Haentjens products, the HAZLETON SLUDGE PUMP was designed with just one object in mind—to produce the finest equipment possible for the job it was to do. The two following specimen performances indicate to what a high degree the HAZLETON is fulfilling all expectations:

1. A 6" HAZLETON SLUDGE handling 75 tons of silt daily through 1,000 ft. of 6" wood pipe against a head of 55 ft. Installed in 1925. First major repairs—September, 1930!
2. A 2,000 G. P. M. HAZLETON Sand Circulation Pump in a Chance System. In operation over sixteen months and the casing is still in excellent condition. The impeller and casing ring were replaced after thirteen months service.

Once more, we repeat . . . *This is Sludge-Pump PERFORMANCE!*

BARRETT, HAENTJENS & CO.

HAZLETON, PENNA.

When Buying Mechanized

Look for the G-E Monogram

THESE leaders selected G-E motors and control because of their proved reliability, high over-all efficiency, and ability to stand the gaff under the most trying conditions. Their choice emphasizes the confidence of the mining world in General Electric.

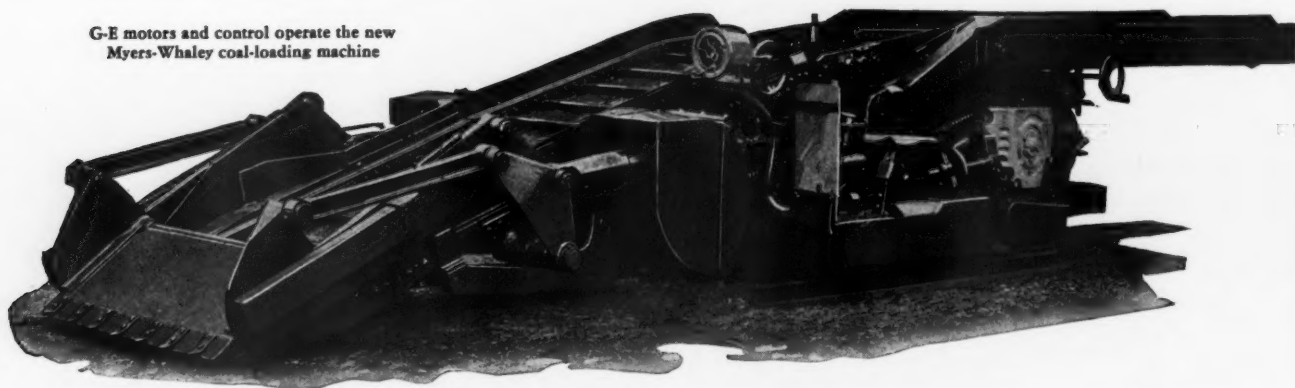
Specify G-E motors and control when buying mechanized mining equipment; it will give your machines the added asset of increased dependability.

You are invited to visit General Electric booths 411, 413, 415, and 417, at the National Exposition of Coal-mine Equipment held under the auspices of the American Mining Congress, at Cincinnati, May 11 to 15.



Combined cutting and shearing machine
manufactured by Sullivan; motorized by
General Electric

G-E motors and control operate the new
Myers-Whaley coal-loading machine



GENERAL

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Mining Equipment

on the Motors and Control That Operate It



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JOIN US IN THE GENERAL ELECTRIC PROGRAM, BROADCAST EVERY SATURDAY EVENING ON A NATION-WIDE N.B.C. NETWORK

ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

JAMISON COAL & COKE COMPANY PROVES THE EFFICIENCY AND ADVANTAGE OF DRY CLEANING COAL UNSIZED BY THE PEALE-DAVIS SYSTEM. *** IN ADDITION TO ITS CRAB TREE PLANT ITS NEW HANNASTOWN PLANT WILL GO INTO OPERATION DURING MAY

JAMISON COAL & COKE COMPANY
JAMISON BUILDING
GREENSBURG, PA. April 10th, 1931

C. E. COOPER
Chief Engineer

Pennsylvania Mining Machinery Corporation,
New York City.
Gentlemen:-

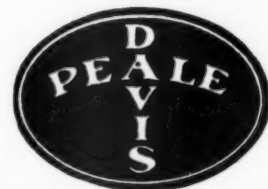
In reply to your letter of April 7th, we are very glad to be able to say to you that your table at our No. 4 Mine, which has now been in use for five months, is giving results substantially better than those obtained at your testing plant. Further, there has been no annoyance or delay from mechanical difficulties.

Very truly yours,

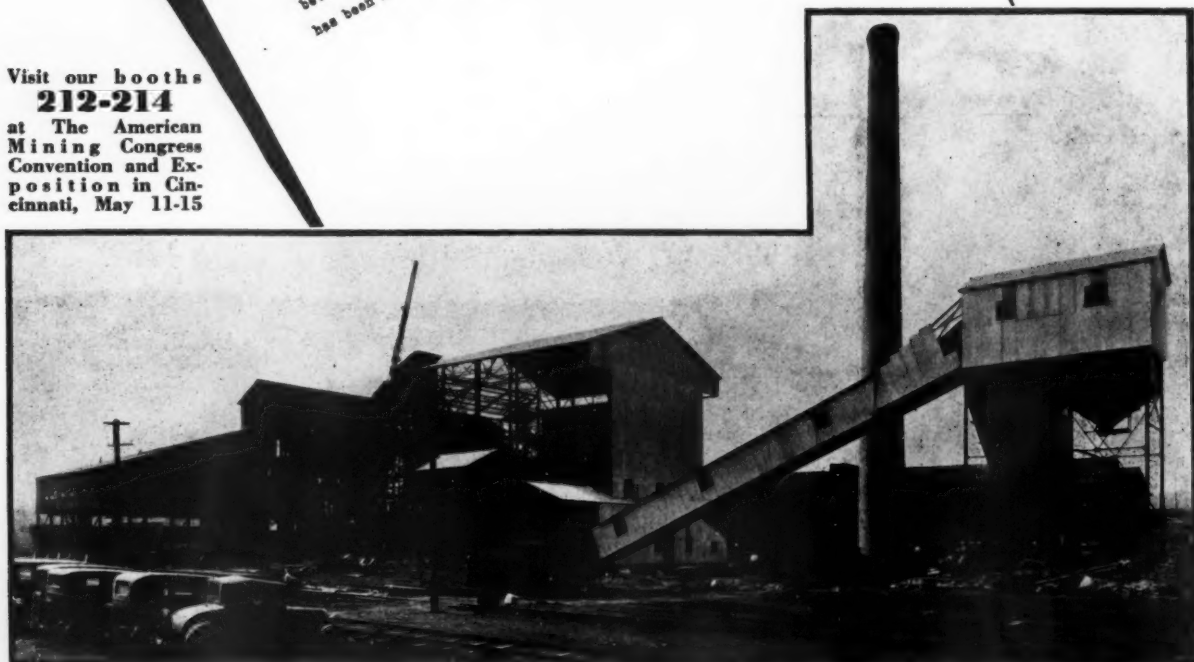
JAMISON COAL & COKE COMPANY
Chief Engineer

The PENNSYLVANIA MINING
MACHINERY CORPORATION

St. Benedict, Pa.
2007 GRAYBAR BLDG.
(Grand Central Terminal)
NEW YORK CITY



Visit our booths
212-214
at The American
Mining Congress
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position in Cin-
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For capacity's sake
see this modern mine car
at the Cincinnati Show

Booth 618



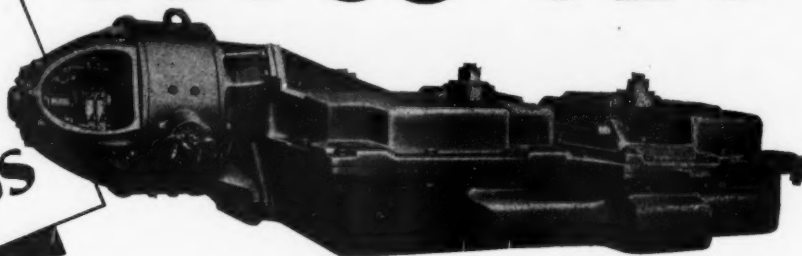
Built by

ENTERPRISE
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Bristol, Va.-Tenn. • Huntington, W. Va.

**PAYS FOR
ITSELF**
Many Times
in
**POWER
SAVINGS**

The New COSCO "C-20"



The First Shaker-Conveyor Drive
Built on an Absolutely

NEW PRINCIPLE

NOT content with its many hundreds of successful installations of the most efficient Shaker Conveyor Systems ever developed for American mining conditions, Cosco engineers have now surpassed even their own former attainments.

To do it, they had to completely revolutionize the basic principle of conveyor drives, used during the past 45 years.

For the first time, details of construction have been scientifically studied, measured, arranged and rearranged until the very maximum peak of operating efficiency was reached. Even the shape of the drive housing was radically improved to permit the compactness required for low roof and other restricted space conditions.

As a result the new COSCO "C-20" Drive, embodying these new principles, is actually 50 per cent more efficient than any previous type.

In power savings alone it will pay for itself several times during its normal life.

In addition its capacity is greatly increased. Its operation is smoother and quieter. It performs superlatively on steep grades.

There was nothing ever before resembling the "C-20" Drive or which compares with it in performance or economy.

It is destined to lead for a long time because its patented features cannot be duplicated or even successfully imitated.

If you value superior performance in your mine conveyors, if you seek greater output, if you care for economy—you should at once invite COSCO engineers to discuss the adaptability for your mines of the "C-20" Drive—American designed, American built, from American materials, for American conditions.

Such an invitation will obligate you in no way.

Write for Special "C-20" Drive Circular.

Convey Your Coal
THE
COSCO
WAY

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299 Broadway, New York

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igan Avenue.
Pittsburg, Kansas

The New COSCO "D-8"



The Little
DRIVE
with the
BIG
PUNCH

Works Efficiently Where a
Bigger Drive Would be Wasteful

at **ONE-FIFTH**
THE COST

ECONOMIC needs have brought economic measures in many fields. Why not in coal mining?

One of the most wasteful wasters in coal production is the use of high power where less power will do the work.

If a dwarf is equal to a task, why employ a giant? That is the question Cosco engineers asked themselves—and then answered it with the new "D-8" Conveyor Drive.

The "D-8" is the smallest, most compact drive made—easily portable and sturdily built to do the day's work without fuss.

It operates efficiently with a 5 to 7½ H.P. motor, but is built to withstand the strains of a 10 H.P. motor. The design, however, permits not larger than a 7½ H.P. motor to be mounted—thus providing definitely against overloading by over-

enthusiastic owners. For, after all, it's a little fellow and there IS a limit to the burden it will carry. Efficiency is its middle name—the most consistent worker at the lowest operating cost ever obtained in a drive of its size.

It is a fit running mate in every respect for the new Cosco "C-20," the drive which has completely revolutionized all previous ideas of conveyor drive performance.

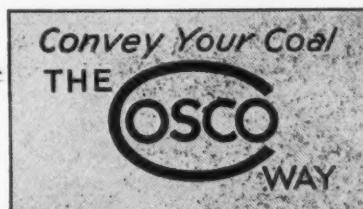
The "D-8" is the ideal small-space drive for conveyors feeding larger systems, or for any other work where a comparatively short line of troughing is to be used.

Cosco Conveyors are saving money for both large and small producers. Hundreds of successful installations are upholding the Cosco reputation in American mines.

Cosco Conveyors, Troughing and "Duckbill" are 100 percent American. Built in America—to American standards—by American workmen—from American materials.

Let our engineers demonstrate what Cosco can do for you in increased production, or lower cost, or both.

CONVEYOR SALES CO., INC.
299 Broadway, New York



Frostburg, Md., 101 Maple Street.
Scranton, Pa., Mears Bldg.
Charleston, W. Va.,
5 Baines Court.

Middlesboro, Ky., 331½ West. Chester Ave.
Salt Lake City, Utah, Salt Lake Hardware Co.
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DISTRICT
SALES
OFFICES



IRON CLAD PROOF of Long Service

Pioneers in the use of steel plates in the bodies of mine cars, PHILLIPS' designs have kept pace with improved mining methods, and in PHILLIPS steel cars you can depend upon well-engineered and thoroughly modern equipment.

Built for a long, high-speed haul, the car illustrated above—one of the many styles of steel cars we have built—may be seen in our exhibit at the Cincinnati Exposition. It was borrowed from the coal company for whom it was built, and is shown exactly as it came from the mine after 14 months' service. It shows a number of interesting features, among which are the design of the draft-rigging, preventing excessive slack in the couplers, and the efficient use of plain-bearing wheels on a car of this size.

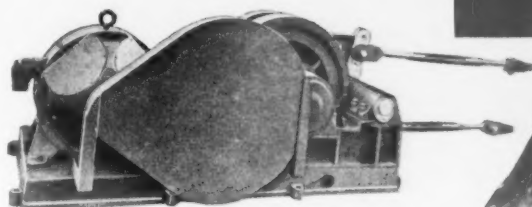
Be sure to visit Booths 204-206

PHILLIPS MINE & MILL
SUPPLY COMPANY
PITTSBURGH, PENNA.

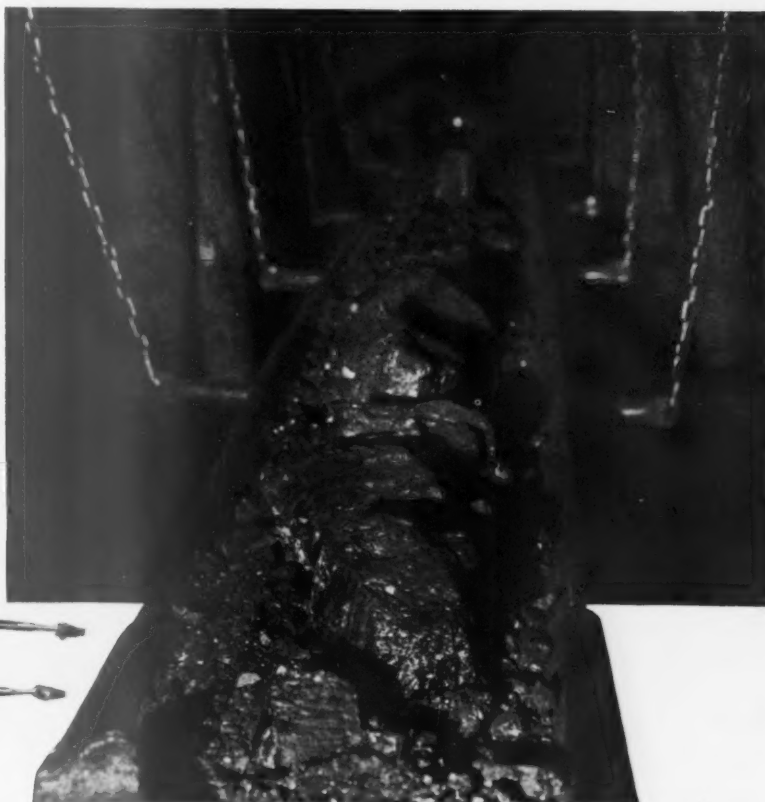
Long life is also built into all Phillips Wheels, whether plain or roller bearing. Well designed flanges and heavily chilled treads, together with the annealing of all wheels, make for maximum wear and freedom from breakage.



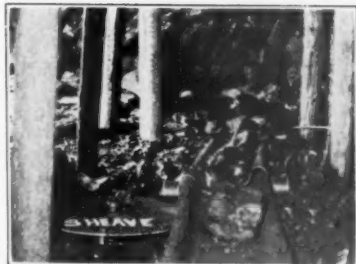
One DRIVE UNIT



LARGE DRIVE UNIT



operates a group of Jones conveyors



A NUMBER of conveyors may be operated from one drive mechanism. On some layouts, as much as 3,000 feet of Jones Flexible Conveyor are driven by one machine.

Any lateral or room conveyor may be stopped or started without interfering with the operation.

The bell crank used to take motion off the main drive ropes for lateral conveyors may be quickly set at any point to drive places at any angle desired.

These conveyors operate efficiently up slight grades and they are particularly well adapted to gather coal from pitches.

They will take coal away faster than the average crew of

men can load, and will readily handle larger lumps than could safely go into mine cars or run over a tippie. These conveyors operate easily, and are low in power and labor requirements.

Note curvature of face conveyor, mounted on rollers, as shown in the upper photograph, left. No effort for the miner to throw the end of the conveyor to either side of the room.

The lower left photograph shows the bell crank connection for room conveyor. Motion is taken off main drive ropes for laterals.

JONES

Flexible Conveyor Co.

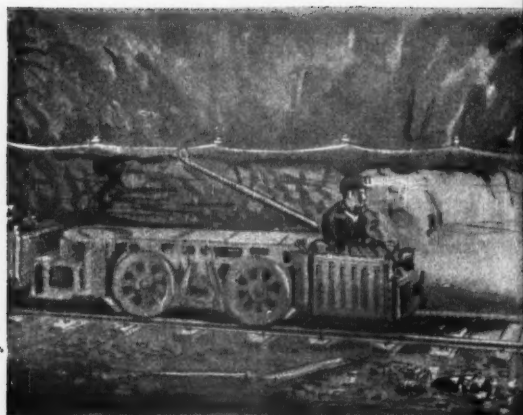
405 PENN AVE.

IF YOU have a conveying problem, let us send you further information about the Jones Flexible Conveyor, or see us at Booth No. 226 at Cincinnati.

PITTSBURGH, PA.



YOUR FUTURE



AUXILIARIES . . . Westinghouse SK Motors are used extensively on such equipment as pumps, compressors, fans, and blowers. This Explosion-tested SK Motor and Control drive a Weinman gathering pump in the Carolina Mine of the Consolidation Coal Co.



POWER . . . This Westinghouse-equipped 500-kw. Automatic Substation supplies power for the Ebensburg Coal Co., Johnstown, Pa. All dangerous live parts are enclosed in the steel cubicle at the right of the switchboard. Cool operation of the motor-generator is assured by the arc-welded construction of the frame which permits adequate ventilation.



DRILLING . . . a 6-foot hole in 30 seconds at the Wildwood Mine of the Butler Consolidated Coal Company. The Sullivan drill is equipped with Westinghouse Explosion-tested SK Motor and Control.

ECONOMIES are Underground

RECENT improvements in top works equipment have brought many economies to the production of the cleaned and prepared coal demanded by coal buyers today. For additional savings, you must call upon your underground equipment for greater economies.

A well thought out electrical system can contribute much to this economy program.

Such items as the location and capacity of substation, distribution system, and switching equipment must be studied with reference to your plan of working and schedule of future development if the full value of your mechanization program is to be realized. Pumping and ventilating units must have adequate motor drives. Cutting, loading, and conveying machin-

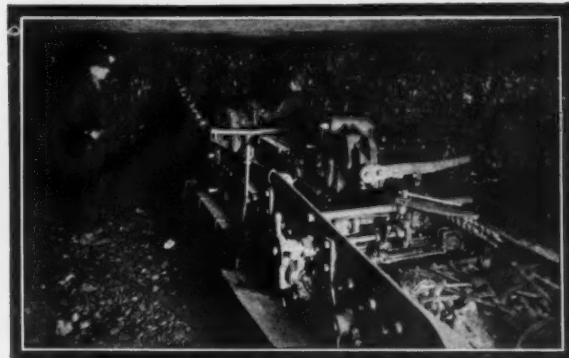
ery must have dependable, correctly applied power, to operate with full efficiency.

Since the beginning of coal mine mechanization, Westinghouse engineers have been active in the applications of electric power to every phase of mining—in all degrees of mechanization—supplying electrical equipment designed and built for mining service. Westinghouse coal mine substations, stationary and portable, provide your machinery with electric power dependably and economically. Westinghouse SK motors and control keep every type of mining machinery on the job, as is indicated by the photographs on these pages.

In planning your underground economy program, we offer our assistance.



ROCK DUSTING . . . A recognized safety precaution—a safe and dependable motor. This Mine Safety Appliance Company rock duster is equipped with Westinghouse Explosion-tested SK Motor and Control.



CUTTING . . . is done economically in this Union Collieries Mine near Pittsburgh. The Sullivan machine is driven by a special Westinghouse Explosion-tested SK Motor and Control—developed specifically for this particular application.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

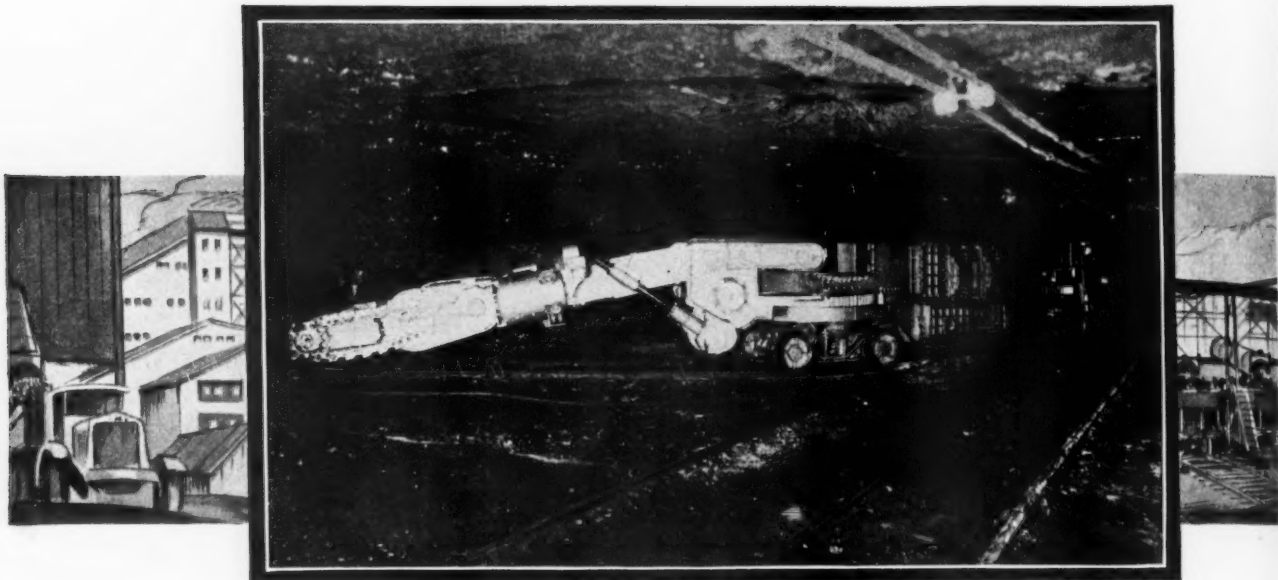
Westinghouse



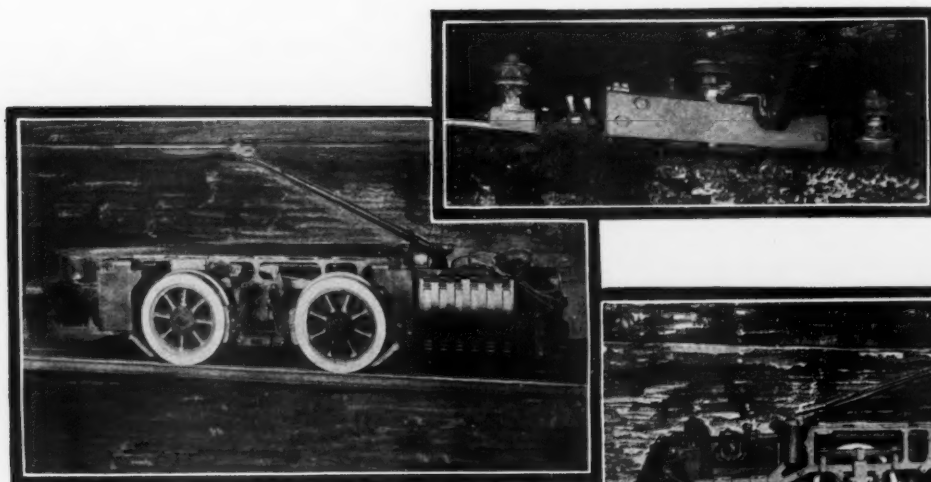
T 31800

TUNE IN THE WESTINGHOUSE PROGRAM OVER KDKA, KYW, WBZ AND ASSOCIATED N. B. C. STATIONS SUNDAY EVENINGS.

LOADING AND

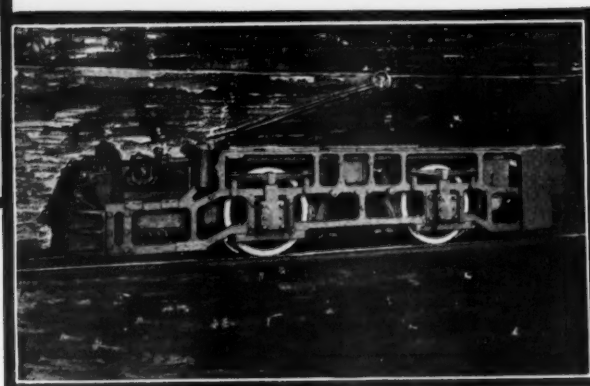


LOADING . . . Oldroyd loading machine for 100 per cent mechanized loading. This loader, the largest ever used in coal mining, is operated by 13 explosion-tested SK Motors. It loads a 5-ton car in 30 seconds.



GATHERING . . . This 8-ton Baldwin-Westingshouse Explosion-tested Gathering Locomotive operates in a thin-seam vein in West Virginia. This unit is designed with: bar steel frame; 26-inch overall height; 43-inch wheel-base; 12-ft. 2-in. overall length; and powerful, slow-speed motors with roller axle bearings.

LINE MATERIAL . . . Westinghouse line material is standard at the Wildwood Mine of The Butler Consolidated Coal Company. Here are shown a Double-gap Section Insulator and two type BF suspension and Archi heavy duty mine clamps.



HAULAGE . . . Two of these 15-ton Trolley-type Baldwin-Westingshouse Locomotives operate in the Jerome Mine of the Hillman Coal and Coke Co. Each one is driven by two 90-hp., Type 939C4 Motors and Electro-pneumatic Unit-switch Type HL Control and Air Brakes.

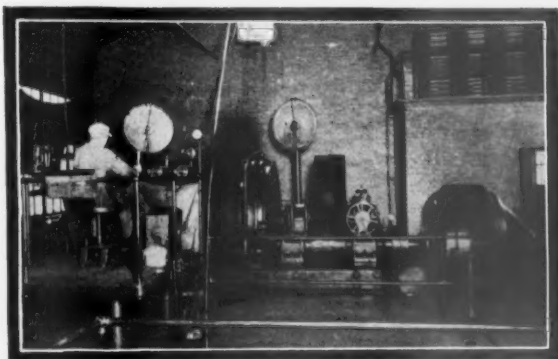
HAULAGE *to meet* *your* TIPPLE DEMANDS

WITH smoothness and precision, mechanized loading and haulage will respond to every demand for coal in the tippie. Provided, of course, that the underground electrical equipment has been built and applied with a knowledge of the requirements of the service.

Such knowledge has guided Westinghouse in building the Type SK Motor. Because of its ability to outlast other direct-current mine motors, it is the coal industry's choice for powering loaders, conveyors, and hoists of many types. This motor is built with matched control, in standard or explosion-tested types.

Serving in all coal fields, you will find more than 9,000 Baldwin-Westinghouse gathering and haulage locomotives, providing reliable and efficient transportation at a minimum cost per ton mile. And Westinghouse line material helps them develop their full power.

Westinghouse supplies every electrical product required for complete mine mechanization, from face to cleaning plant. Consider the advantage of placing upon one manufacturer—a pioneer in coal mine electrification—the responsibility for the satisfactory operation of your complete electrical installation.



HOISTING . . . This hoist in the Union Collieries Company Renton Mine near Pittsburgh is driven by a Westinghouse wound rotor Motor and Control.



SCRAPER HOIST . . . Westinghouse-powered machines serve in all degrees of mechanized loading to speed up delivery. This shows a Sullivan scraper hoist powered by a Westinghouse SK Motor.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

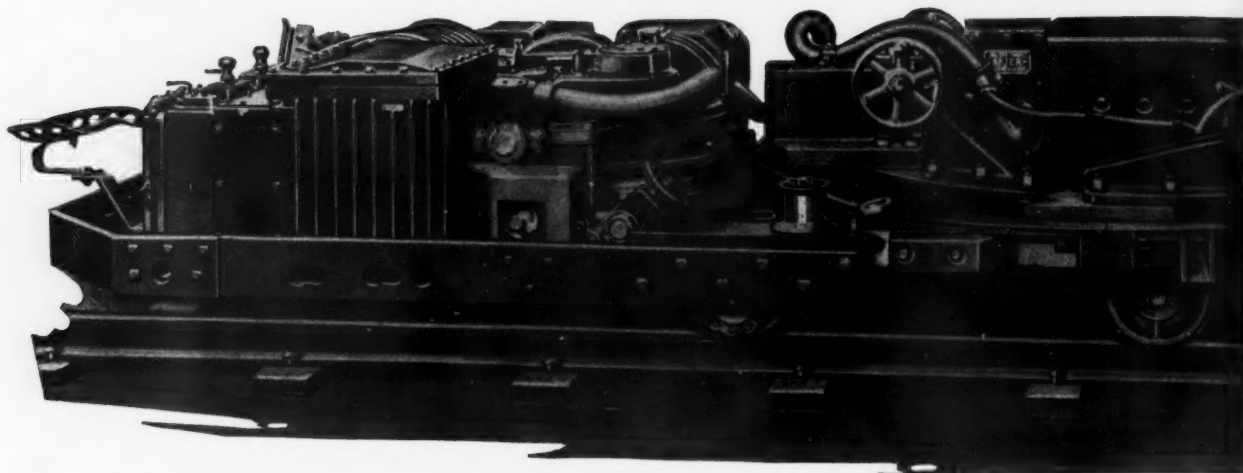
Westinghouse



T 31800-A

TUNE IN THE WESTINGHOUSE PROGRAM OVER KDKA, KYW, WBZ AND ASSOCIATED N. B. C. STATIONS SUNDAY EVENINGS

Modern Goodman Equipm



Powerful—Rugged—Easy to Operate—Low Maintenance—

Powerful:—Two powerful ball bearing motors supply power for all movements and operations. The cutting motor drives the cutter chain and elevates and lowers the cutter bar. The feed motor has two speeds and operates the wire rope drum, traveling and swinging mechanism.

Rugged:—The machine is built to withstand the most severe cutting conditions and the usual rough mine usage.

Easy to Operate:—All operating controls are conveniently placed, so that the operator and runner have the machine under positive control at all times.

Low Maintenance:—Due to the advanced engineering principles incorporated in this new cutter, and the ruggedness of its construction, maintenance costs are reduced to a minimum.

Duckbill Loading Head for Shaker Conveyors

Duckbill is a self-loading device for shaker conveyor heads, eliminating hand loading of the conveyor.

Duckbill is designed to fit any substantially built conveyor.

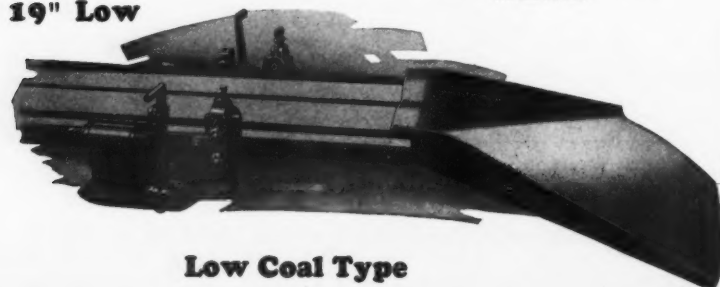
Duckbill is the only loading device which will load coal in any thickness of seam.

Duckbill, being of sturdy and rugged build, requires minimum maintenance costs.

Duckbill requires no skilled attendance. Any mine laborer can operate it.

Duckbill makes big savings in time and cost of loading.

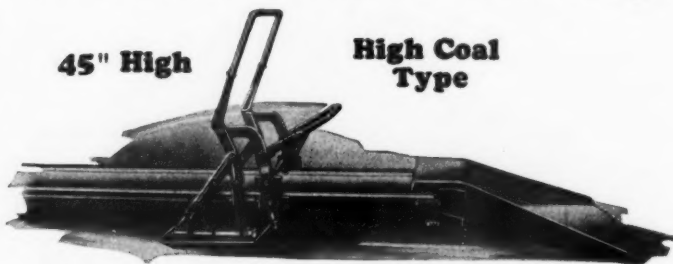
19" Low



Low Coal Type

45" High

High Coal Type



Goodman Special Shaker Conveyor Drive

Type-172, 25-30 hp.

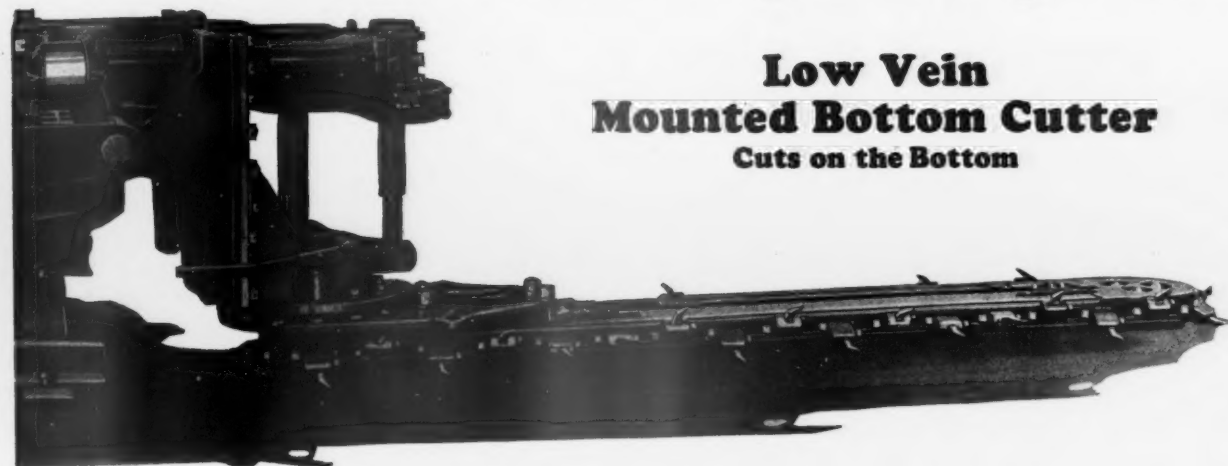
May be attached to any make of conveyor trough.

Ball bearing intermediate and crank shafts.

Highly effective shaker motion.

Automatic, positive lubrication.

ent at the Mining Congress



**Low Vein
Mounted Bottom Cutter**
Cuts on the Bottom

Cuts a Smooth Floor—Stays on the Track—29 1-2 Inches Low

Cuts a Smooth Floor:—The flexibility of the cutter bar of the Goodman machine permits the runners to cut just as smooth a floor as they desire. Adjustments for endwise or sidewise tilting of the cutter bar may be made easily and quickly.

Stays on the Track:—The entire frame of the machine is supported over the axles on three points, thus permitting the machine to ride smoothly over irregular track or obstructions on the rails.

Specifications:—Traveling height, 30 in. Cutting heights (top of rail to bottom of kerf), 5 in. above the rail to 8 in. below it. Open or Government permissible electrical construction. Cutter chain made of heat-treated, alloy steel, forged blocks having two set screw holes permitting the setting of bits for cutting in either direction. Track gauge limits, 24 to 56½ in. Automatic cable reel.

Red Devil Moveable Pit Car Loader

Red Devil has flights high enough to handle the largest lumps.

Red Devil may be had in many types and sizes. Open or Government approved electrical construction.

Red Devil is easily operated. All loading adjustments may be made easily and quickly.

Red Devil is easily moved from place to place, because of proper balance upon the axle.

Red Devil is fully enclosed, yet readily accessible.

Red Devil is built rugged to withstand the usual rough mine usage.

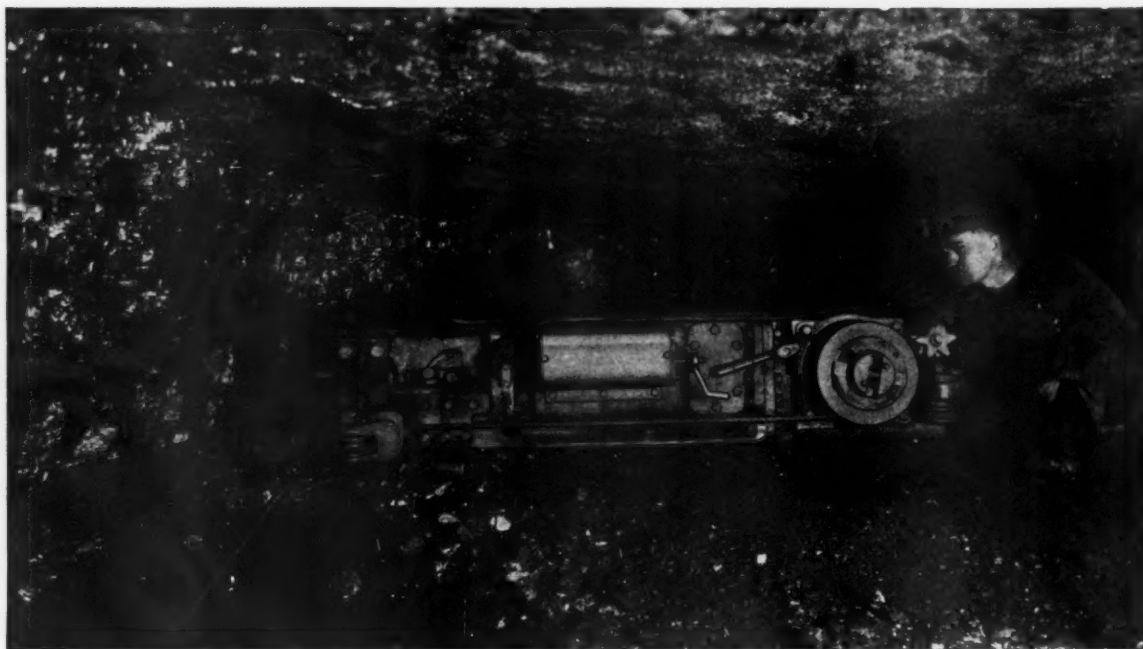
Red Devil not only reduces the cost of loading, but increases the percentage of lump as well.



**Model-70
For
High
Coal**

(47)

GOODMAN MANUFACTURING COMPANY
Locomotives - Loaders - Coal Cutters
HALSTED ST. at 48TH.
CHICAGO --- ILL.
PITTSBURGH-WILKES-BARRE-HUNTINGTON, W.VA.-BIRMINGHAM-ST LOUIS-DENVER-PRICE, UTAH



"CR-2" Low Vein (15½-in.) Rope-Feed Ironclad crossing the face

Modernization at the Face—

—Spirit of Sullivan Equipment on Display at Mining Congress

Sullivan Ironclad Coal Cutters, for every coal cutting need

Sullivan "CLU" 3-in-1 coal cutters will undercut, overcut, or shear, and they are provided with a drill for making shot holes. The new Rope Feed Sullivan Ironclads, the "CR-2" (15½-in. high) and the "CR-3" (standard) are proving popular with machine operators and mine executives. Rugged stamina, ability to carry overload. Each of these machines has its features that make for ease of handling, high cutting capacity, satisfactory service day after day.

Longwall Ironclads (only 12 in. high) acknowledged leaders in Longwall fields throughout the world—Arkutters, Shearers, Center Band Cutters, Strip Pit Channelers—there is truly a modern Sullivan Ironclad for each mining need. *Bulletin 82-D, Longwall, 82-G, Low Vein Rope Feed Ironclads.*

Sullivan Drills

For excavating rock in the mine, in shaft, tunnel, or entry, Sullivan Rotators, Drifters or Stoppers, do the work rapidly and at low cost. *Sullivan Pick Hammers* for undercutting, snubbing, etc., are favorites. Bulletins on request.

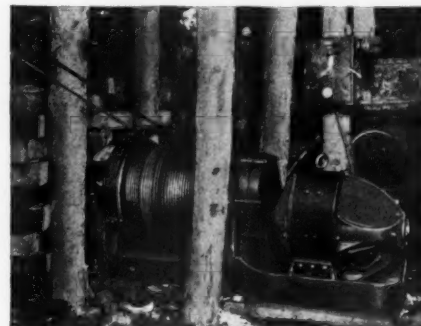
The "CD-4" *Self-Propelling Electric Drill* bores 9-ft. holes in less than 2 minutes, and spots them anywhere and at any angle. *Bulletin 82-F.*

Other Sullivan Equipment

Sullivan also serves the coal industry with Diamond Core Drills, and contracts for core drilling; Angle Compound Compressors, Drill Steel Sharpeners and Furnaces, and Conveyor Type Electric Loaders, Mine-Car Compressors, Stringalite Lighting Cable.

Sullivan Hoists for Scraper Loading

Sullivan Portable Hoists handle many important jobs with a saving. This includes scraper loading, in both the anthracite and bituminous fields, car pulling, and miscellaneous hoisting work. Sullivan engineers have aided in working out low cost scraper-loading programs under many conditions, both in the U. S. A. and in foreign fields. Data sent upon request. Sullivan Hoists are available in single and two drum models to 15 H. P. (*Bulletin 76-J*).



BOOTH 581-630,

AMERICAN MINING CONGRESS

SULLIVAN

SULLIVAN MACHINERY COMPANY

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Mt. Vernon, Ill.	New York					Salt Lake City	Spokane	
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London	Paris	Vienna	Johannesburg	Calcutta	Sydney	Tokyo	Santiago	

AN INVITATION

At the Eighth Annual Convention of the American Mining Congress in Cincinnati, the Fairmont Mining Machinery Company will display some of the latest coal handling and preparation equipment.

Booths 210-212-311 and 313.

You are cordially invited to inspect this exhibit.

ON DISPLAY

Underground Conveyors

Vibrator Screen

Mine Pump

Car Retarder

Model—Peale-Davis Cleaning Table

Photographs—Literature

FAIRMONT MINING MACHINERY CO.

FAIRMONT, W. Va.

Branch Offices: New York, 15 Broad Street; Pittsburgh; Huntington, W. Va.

Pumps Tipples Conveyors Car Retarders Screens Car Hauls Picking Tables Underground Conveyors

ASSEMBLED



HALF-APART

US
STEEL

COLLAPSED



QUICK ACTING !

Turn the keeper, knock out the wedge—and the Jack is collapsed. A strong chain holds the parts together, ready for speedy recovery.

Control your mine roofs with Langham Mine Post Jacks—they will bring greater security and new efficiency into your longwall and pillar operations. The Jacks are available in the 10, 15, 20, 26, 32, 34, 36 and 38-inch sizes.

Other quality items in the LORAIN line are: Timber Jacks, Sectional Conveyors, Portable Face Conveyors, Steel and Composite Mine Cars and Mine Trackwork.

The Lorain Steel Company

General Offices: 545 Central Ave., Johnstown, Pennsylvania

Subsidiary of United States Steel Corporation

Sales Offices: ATLANTA CHICAGO CLEVELAND DALLAS
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Pacific Coast Distributors:—Columbia Steel Company, Russ Building,
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Export Distributors: United States Steel Products Company,
30 Church St., New York City, N. Y.

LANGHAM MINE POST JACKS LORAIN

LORAIN

SECTIONAL CONVEYORS

*A Profitable
Form of
Transportation*




In a room and pillar layout where LORAIN Sectional Conveyors have been installed, each miner has produced an average of 16.23 net tons per shift as against 7.28 tons under the old system. In similiar installations, averages such as 11.92, 17.09, 16.01, and 15.16 net tons per man per shift are not considered unusual—even with the face men working on their knees in low coal. Three men in three minutes can take out or add an intermediate section. For longwall mining, too, LORAIN Conveyors are a profitable form of transportation. It will pay you to investigate carefully.

THE LORAIN STEEL COMPANY, Johnstown, Pa.

Subsidiary of United  States Steel Corporation

AMERICAN BRIDGE COMPANY
AMERICAN SHEET AND TIN PLATE COMPANY
AMERICAN STEEL AND WIRE COMPANY
CARNEGIE STEEL COMPANY

PRINCIPAL SUBSIDIARY  MANUFACTURING COMPANIES
COLUMBIA STEEL COMPANY
CYCLONE FENCE COMPANY
FEDERAL SHIPBUILDING AND DRY DOCK COMPANY
Rum Building, San Francisco, Calif.

ILLINOIS STEEL COMPANY
MINNESOTA STEEL COMPANY
NATIONAL TUBE COMPANY

OIL WELL SUPPLY COMPANY
THE LORAIN STEEL COMPANY
TENNESSEE COAL, IRON & R. R. COMPANY
UNIVERSAL ATLAS CEMENT COMPANY
Export Distributors—United States Steel Products Company, 30 Church Street, New York, N. Y.

LORAIN SALES OFFICES—Atlanta

Chicago

Cleveland

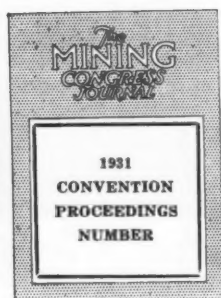
Dallas

New York

Philadelphia

Pittsburgh

EXTRA



"EXTRA! MODERNIZATION EFFECTS AMAZING RESULTS IN LARGE AMERICAN MINES! EXTRA! NEW ACCIDENT-PREVENTION METHODS BREAK ALL SAFETY RECORDS AND SAVE COAL OPERATORS THOUSANDS! EXTRA! ANTHRACITE RESEARCH UNEARTHS AMAZING DISCOVERIES! EXTRA! EXTRA!" ▲ HEADLINES FROM THIS MORNING'S PAPERS? MORE IMPORTANT THAN THAT! ADVANCE GLIMPSES OF THE BIGGEST MINING NEWS OF THE YEAR—THE AMERICAN MINING CONGRESS CONVENTION PAPERS—SOON TO APPEAR IN THE CONVENTION PROCEEDINGS NUMBER OF THE MINING CONGRESS JOURNAL. ▲ EVERY PAGE OF THIS BIG EXCLUSIVE FEATURE NUMBER OF THE JOURNAL WILL BE PACKED WITH INTERESTING MINING NEWS . . . WITH PRACTICAL MINING FACTS . . . WITH TESTED AND PROVEN MONEY-MAKING MINING IDEAS THAT YOU CAN USE ▲ IT IS A NUMBER THAT YOU WILL WANT IN YOUR PERMANENT REFERENCE LIBRARY ▲ ORDER YOUR COPIES NOW!

THE
MINING CONGRESS JOURNAL

841 MUNSEY BUILDING
WASHINGTON, D. C.

Now *is the time to study* YOUR BLASTING METHODS

A MESSAGE TO THE INDUSTRIAL LEADERS
OF AMERICA *first of a series*



PRESENT business conditions make it imperative that operators analyze plant operation thoroughly, with a view to obtaining lower production costs and increased efficiency. Inasmuch as explosives constitute a very important item of expense in mining and quarrying, their proper selection and use have a great effect on operating costs; consequently, these factors should be given the utmost consideration in any analysis of plant operation costs.

THE remarkable progress that has been made in the development and use of explosives in the last few years well merits the attention of all operators, large and small. Not only have better explosives values been developed but qualified explosives engineers are available to assist in the proper selection and application of these modern explosives, with the result that mining and quarrying costs today are being lowered to a point undreamed of a few years ago.

IN the past year, no single development in explosives has been more important than the higher-count gelatin-type explosives originated by Hercules. These explosives, known as the Gelamites, can satisfactorily replace gelatin dynamites under most conditions at a great saving. In metal mining, quarrying, and construction, the Gelamites have been proved so successful that every operator not familiar with them should investigate their possibilities.

THE high-count ammonia dynamites which were introduced by Hercules many years ago, and which in their improved form are now known as the Hercomites, continue to replace older grades because of their economy, performance, and added safety. The superiority reflected in these qualities explains the mounting favor of the Hercomites because it means that when intelligently selected and applied, the Hercomites reduce production costs materially.

COAL mining operators should be interested in permissibles that not only afford added *safety* but also produce *clean lump coal economically*. Hercules research has produced permissibles embodying properties that give them these vitally important qualities. In fact, so successful have been these permissibles—Red HC - L. F., Red HF - L. F., and the Hercoals—that they now comprise a high percentage of permissible sales.

PRESENT-DAY explosives offer greater values than ever, and their scientific application means appreciably lower blasting costs, resulting in decreased production costs. If ever operators needed lower production costs, it is now. Our experience in the development, selection, and application of explosives to every industry enables us to offer a distinct service to users of explosives. Perhaps we can help you.

ALLENTOWN, PA.
BIRMINGHAM
BUFFALO
CHICAGO
DENVER
DULUTH

HERCULES POWDER COMPANY

INCORPORATED

934 King Street - Wilmington, Delaware

HAZLETON, PA.
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NEW YORK CITY
PITTSBURG, KAN.

PITTSBURGH, PA.
ST. LOUIS
SALT LAKE CITY
SAN FRANCISCO
WILKES-BARRE
WILMINGTON, DEL.

A NEW Keystone Steel Tie that increases the efficiency of haulage track



**Keystone
NO. 6
Steel Tie**



Haulage track should be good track, yet the frequency with which it causes delays at the working face often seriously interrupts loading operations.

The new Keystone No. 6 Steel Ties when used in mine track strengthen the track structure and assure trouble-free haulage. These steel ties are not affected by dry rot or dampness and of course never become spike-killed. Their ease of installation and removal makes them particularly suitable for the transfer of operations from heading to heading. They may be used over and over again without impairing their holding power. Keystone No. 6 Steel Ties make good track—track that is accurately held to gage and kept in alignment—track that is safe for the smooth haulage of heavily-loaded cars.

The Keystone No. 6 Steel Tie is made of rolled steel with welded tie-plates. It is equipped with 4 rail clips, 2 short and 2 long ones. By interchanging the clips the gage may be varied $\frac{1}{4}$ in. on each rail, or a total change in gage of $\frac{1}{2}$ in. The clips are held firmly in position over the rail base by $\frac{5}{8}$ in. bolts and Unit Lock Nuts. The ends of the tie are depressed and flared, giving it a firm grip on the ballast and preventing side movement of the track. The Keystone No. 6 Steel Tie weighs 6 lbs. per ft. and accommodates rails up to 60-lbs.

Bethlehem manufactures a complete line of steel ties designed to meet the varied conditions of mine operation.

BETHLEHEM STEEL COMPANY, General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis.
Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu.

Export Distributor: Bethlehem Steel Export Corporation, 25 Broadway, New York City.

See it at —

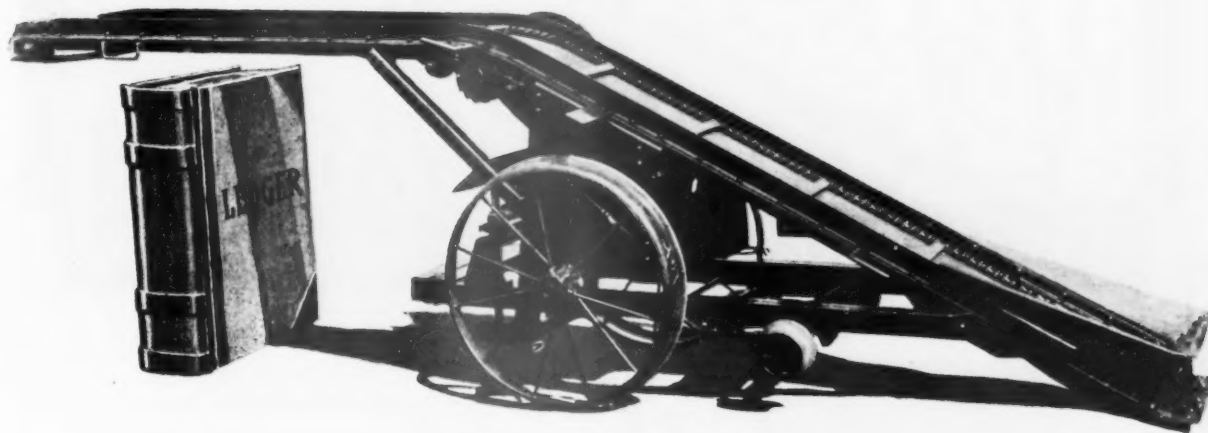
The American Mining Congress
Exhibition

Cincinnati, Ohio, May 11-15, inclusive

Booths 600 & 606

BETHLEHEM

Over the cost barrier!



The Mt. Vernon has many features that appeal to the mechanical department. The ball bearings housed and sealed in grease, the rigid frame and the flexibility in use, the simplicity of construction and control all help to insure trouble-free, efficient service.

Visit our Booth 539
at The American Mining
Congress Exposition
in Cincinnati, May 11-15

HAND loading is costly and many forms of mechanization are prohibitive in price of loaders and supporting equipment, new cleaning plants, etc. Efficient pit car loading has proven to be the way out in many mines. It has developed startlingly—the fastest growing method of loading according to U. S. Bureau of Mines figures. The reason for this is the ease with which they fit into present mining systems without heavy outlay, the speeded production possible, the strength saved, and concentration of workings made possible. Mt. Vernon loaders in their simple design and sturdy construction epitomize the best in pit car loading. They are remarkably easily moved from place to place due to the folding forward truck that puts them on four wheels or lowers their hopper for action instantly. They can handle all that four men can shovel.

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Zinc Chloride treated timber (marked 6) installed in 1914, still sound today! Untreated timber was renewed several times during this period.

IN the past few years, many large mine operators have begun to eliminate waste by preserving their timbers from rot and decay.

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The law of economics will soon cause all mining concerns to treat their timbers with Zinc Chloride in order to gain reductions in cost of replacements and overhead. For only those operators whose operative costs are lowest can hope to make greatest profits in this highly competitive industry.

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ENTHUSIASTIC APPROVAL!

Twenty-one representative coal mining executives express below their opinion of the annual American Mining Congress Coal Convention and Exposition. These opinions are typical of the *enthusiastic approval* which this great national event receives throughout the Industry. The annual Convention Proceedings Number of THE MINING CONGRESS JOURNAL reflects this enthusiastic approval. It is the official Year-Book of the Cincinnati Convention. In it—exclusively—are published the copyrighted Convention Papers recording the most advanced mining practice to date. Mining men throughout the world read this number of THE JOURNAL again and again. They study it. They refer to it constantly throughout the year. Because of its unusual degree of permanence, the forthcoming Convention Proceedings Number presents to the manufacturer of all kinds of mining equipment an unparalleled opportunity . . . an opportunity to reach this more-than-\$100,000,000, active "machine-minded" market many times over . . . AT THE COST OF ONE INSERTION! Read on—

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" . . . the most important meeting of coal men held during the year . . ."

A. J. Musser, *Vice Pres. & Genl. Mgr., Clearfield Bituminous Coal Corp.*

"Of course, everything there presented and discussed cannot be fully absorbed at the time but when the Convention is subsequently fully reported in the Mining Congress Journal and the papers and discussions reviewed in that Journal, then the men who had the privilege of hearing such discussions review the various subjects printed in the Journal and thus get the utmost benefit."

A. B. Kelley, *Genl. Mgr., Humphreys Coal & Coke Co.*

" . . . four thousand operating officials gather, officials who represent the coal industry from every coal field in the United States, Canada, Mexico, and distant foreign fields."

Edward Bottomley, *Genl. Supt., Sheridan-Wyoming Coal Co.*

"I don't know of any other opportunity . . . to see modern mining machinery and equipment of every description demonstrated to such an extent as I have seen at the Cincinnati Convention."

F. S. Pfahler, *Vice President and General Manager, Superior Coal Co.*

" . . . an opportunity to see all kinds of modern machinery."

Paul Weir, *Vice President, Bell & Zoller Coal & Mining Co.*

"Year after year the attendance increases and the exposition becomes larger and finer."

C. M. Lingle, *Vice President, The Buckeye Coal Co.*

"The practical demonstration of the latest types of modern mining equipment and machinery in the show rooms of the Congress creates a desire for better and more efficiency . . ."

Dr. L. E. Young, *Vice President, Pittsburgh Coal Co.*

"The program and plans for the 1931 Convention and Exposition will include the essential features of previous years and a number of new ideas that should result in even greater interest among the coal mining fraternity."

G. W. Hay, *Gen'l Mgr., Elk Horn Coal Corp.*

" . . . a clear picture of what can be expected and what is to be gained by the introduction of the most modern equipment."

W. D. Brennan, *Pres. and Gen'l Mgr., Utah Fuel Co.*

"To operating officials whose activities are hundreds of miles away from Cincinnati, this is their Spring mecca."

Carl J. Fletcher, *President, Old Knox Mining Co.*

" . . . the operators through carefully arranged programs were able to inspect and compare the latest developments in mining machinery."

George B. Harrington, *President, Chicago, Wilmington & Franklin Coal Co.*

" . . . a chance to see first hand the new improvements in mining equipment and machinery."

J. B. Warriner, *President, Lehigh Navigation Coal Co.*

"The Cincinnati meeting affords just the sort of contacts which practical mining men need at regular intervals."

Horace Moses, *Manager, Gallup American Coal Company.*

" . . . of intense interest to those connected with the industry."

A. M. Fine, *Vice President, Hudson Coal Co.*

" . . . most helpful to those attending in aiding them to keep in step with the march of progress in coal mining."

Eugene McAuliffe, *President, Union Pacific Coal Co.*

" . . . invariably represents a substantial contribution to mining technique."

Louis C. Madeira, III, *Madeira, Hill & Co.*

"Each company should be represented by one or more of its staff at these gatherings."

K. A. Spencer, *Treas. and Chief Engr., Pittsburgh & Midway Coal Mining Company.*

" . . . in the shortest possible time an insight into what the mining industry at large is doing . . ."

D. D. Muir, Jr., *Vice Pres. and Genl. Mgr., United States Fuel Co.*

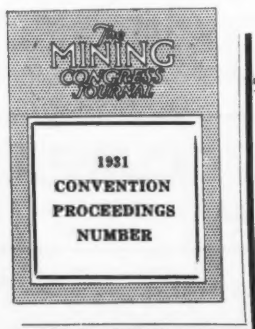
"No man connected with coal mining in attendance at the Convention can help but gain . . ."

J. G. Puterbaugh, *President, The McAlester Fuel Co.*

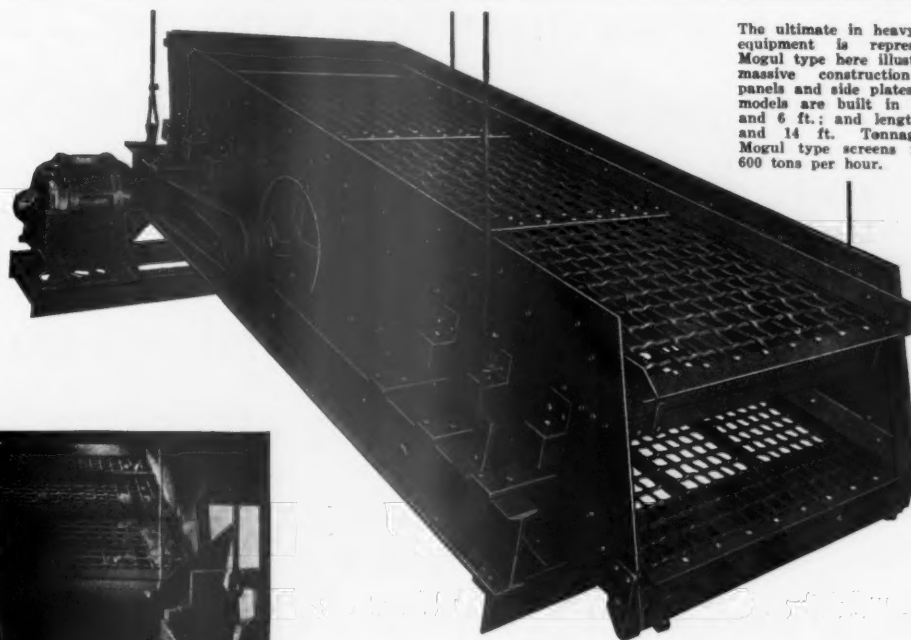
"I know of no way in which coal operators and their operating men can get anything like as much information . . . as by attending this meeting."

Wesley S. Harris, *President, Bicknell Coal Co.*

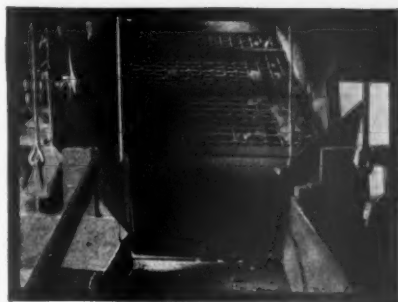
"Practical coal operating men who are privileged to attend . . . will be amply rewarded."



THE
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BOOTH No. 512, American Mining Congress Exposition, Cincinnati

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Editorials

Money and Foreign Trade

IN THIS country we take pride in the development of a sound monetary system—a system which can be expanded to meet increasing business activities and contracted when the money demand has subsided. This system is based upon the gold standard. As it relates to our home consumption of 90 percent of our possible production, the gold standard has been an unqualified benefit to the nation. These benefits have been intensified by world demands upon our industrial production which has brought to this country almost half of the total world gold monetary reserves.

The business prosperity of the nations of the world is in a general way in proportion to the amount of sound money which each of the countries control in proportion to its volume of trade. At one time the British Empire was altogether the most prosperous of any of the world nations. The United States was struggling for a place in world business and to pay off her foreign obligations, payable in gold, largely held by England. France and the United States have become the two most prosperous nations in the world and these nations control considerably more than half of the world's gold. The population of these countries is but a small percentage of the total world population. The issuance of fiat money by any nation carries with it positive danger to financial stability. Our own Federal banking system with its marvelous ability to meet the demand for increasing currency has in it also the elements of grave abuse if controlled by men lacking the proper conception of the fundamentals of monetary exchange.

How then are we to stabilize the money mediums of the world upon some basis which is constant, which is ample for business needs, and which is so regulated as to prevent inflation and rising price levels upon one hand and falling price levels and business depression upon the other.

This is a problem the solution of which requires real statesmanship. A division of the world's gold supply among the nations of the world upon some basis proportioned to the population and industrial activity, might if it were possible, furnish a solution but such a solution is both impractical and impossible. Such division of the world's gold reserves would cripple our own financial independence. Shall we not then seek as the supporting basis of currency some other substance, the supply of which does not fluctuate in amount and which may be used as a supplement to gold in supporting the money medium of those countries whose markets we desire to enter but which are without purchasing power because lacking a monetary medium to stimulate business activity. To be more specific, the world gold production has reached its zenith. The world's silver sup-

ply throughout the ages has been on a basis of approximately 14 to 1. The ratio of production of gold and silver has varied when new discoveries have been made but only for a short period of time.

The production of both metals in any one year does not materially increase or decrease the world's reserve, and, therefore, jointly furnish a safe and uniform basis of exchange. Gold alone can not and will not keep pace with the growing demand for a metallic base for business credit without which the issues of credit money may easily lead to inflation.

Is it not time that consideration should be given to the importance of a world-wide movement for sound money, for a stabilization of world currencies as the basis of world commerce and world earning power which can make available the comforts of life to an increasing circle of prosperous and happy people not only from the selfish standpoint of our own prosperity but for the more altruistic purpose of leading away from world wars and into fields of prosperity and contentment.

Sound Money

THERE are many financiers who believe that gold reserves as a measure of value, might vanish without greatly disturbing financial conditions.

They insist that gold does not circulate as money; that the support of credit money is only theoretically based on gold; that the ability to settle foreign trade balances is based on Government credit and that the citizens of a country do not inquire whether the paper money with which bills are paid is supported by much or little gold, so long as it is guaranteed by a Government in which they have confidence.

These men argue that if we are to depend upon a metallic base that the amount of gold in the world is entirely inadequate; that all trade balances in the end must be paid in goods rather than in money and therefore that neither gold nor silver are essential and that both should be relegated to their commodity values and their uses for industrial purposes. These views are held by a select coterie of theorists who entirely ignore the psychology of mutual confidence as a necessary basis for any measure of value which will at all times be recognized.

Sound money only will stand the stress of panic. Credit money fully supported may at times be questioned even as a sound banking institution may be the victim of whispered suspicion of insolvency. The march of progress will be backward whenever we abandon the constitutional guarantees of personal liberty and private property or the sound money which has commanded the confidence of the world.

Legislation No Panacea

AS MUCH as we favor methods which will tend to reduce unemployment, we can scarcely agree with Senator Borah that Congress should be in session and "legislating" in behalf of this situation. Legislation is not the solution; it offers no open door to prosperity and is not a panacea for our industrial ailments.

The announcement by the Department of Commerce that we have approximately six million men out of work has started an avalanche of discussion and proposals. Unemployment will not be lessened by a session of Congress; nor by theorists. It can only be met successfully by business itself. It is unthinkable that millions must go hungry, and unclothed, in a country that is fairly teeming with wealth, whose larder is overstocked and that boasts of its efficiency and resourcefulness. It is equally unthinkable that these millions of men, earnestly seeking work, shall be called upon to accept charity at the hands of either Government or organized agencies. That many do not agree with these statements is evidenced by the loud clamor in certain quarters for Congressional action. The "People's Lobby"—whatever that means—agitating for an immediate session of Congress, says:

"Until American business is conducted so intelligently that it will not be afraid of a session of Congress called to secure that fairer distribution of the national income which the past two years have shown to be necessary to create and maintain prosperity, American business stands self-convicted and our traditional system of government large-scale doles to nearly every property and producing interest must give way to the needs of consumers."

But is that the solution? Could any possible good come from governmental action? To agree means to admit that Congressmen are endowed with some greater wisdom, some keener understanding of business, than the captains of industry now in charge.

We haven't the answer to the dilemma. But we will wager that whatever it is, it isn't congressional action, a dole system, or any form of charity. The problem is squarely put to American business. Will it accept the challenge?

No Altruism Involved

AN UNQUESTIONED fundamental principle accepted by our forefathers was that "business had a prior lien upon its earning power." Gradually this notion is being replaced with the more modern and more human thought that other factors aside from capital's earnings must be considered in the business life of a country. Labor and capital are rapidly recognizing the importance of each in the scheme of things. It is particularly noticeable today, when industry finds itself in the throes of a depression. A generation ago, faced with the same set of conditions, business would have immediately and unhesitatingly cut its working force to the bone. Today, enlightened business seeks recourse to reduction of wages and discharge of employees as a last resort. Instead, dividends have been reduced and every effort has been made to keep the forces intact without attempting drastic cuts.

This attitude on the part of capital is not altruism. Far from it. It is "enlightened selfishness." It is the

part of wisdom. Capital has been sold on the idea of the high-wage, more luxuries, theory. It will be interesting to note the result of this attitude of business toward its employees after the depression of 1930-31 has become history.

Where the Government Gets Its Money

EVERYONE knows that it costs a great deal to run the Government. Few take any particular interest in just how the funds are arranged for. Frequently, the unthinking advocate the Government as the unfailing agency to carry out plans when funds are unavailable from private sources.

But someone pays the bill. Details have recently been released concerning the 1929 income tax returns. It is interesting indeed to learn that 76 percent of all returns were made upon incomes of less than \$5,000 annually. This 76 percent represents 34 percent of the net income, and paid 45 percent of the total tax.

The average taxpayer's contribution to Government upkeep from the standpoint of the national income tax, while small, represents a vast sum in the aggregate. It is said that only one in every 50 individuals pays any Federal income tax; yet the total net income of this country in 1929 was \$24,519,296,977, which, of course, does not include the net income of corporations which would add an additional ten billion.

Extension of Government activities can be paid for only by assessing the taxpayer, who is the "someone who pays the bill." Careful scrutiny of all proposals of paternalistic tendency should be a part of the duty of the American citizen. It is easy for state and national legislatures to pass laws creating higher revenue through taxation. It is only when "father gets the bill" that the storm assumes proportions.

Stabilizing Poverty

A RECENT speaker, advocating the maintenance of prosperity, said, "Keeping production down to demand is to stabilize poverty; but to stabilize prosperity we must tackle the problem the other way round—keep demand up to production."

Easier said than done, of course. We have attempted to bring about the millenium through the high-wages-greater-consumption theory, and on the face of it we have failed when we bumped squarely into the old dragon "supply and demand."

Probably the plan has not had sufficient trial. Perhaps we haven't gone as far with it as we have been led to believe. According to an interesting statement from a leading financial house, even though the year, 1929, was a peak year, ninety-two out of every hundred American families were unable to earn enough to require the filing of a personal income tax report. Only eight out of every hundred families could be considered really prosperous!

Dr. Klein of the Department of Commerce is convinced that "we must sustain and strengthen the buying power of our wage earners." We agree. How, is the question. President Green of the American Federation of Labor says by the five-day week for everybody. Whatever the plan, it is certain that there is no unanimity among leaders of any group. Capital, labor and politician conflict with each other with alarming regularity.

A Common Nuisance

AMONG the large fortunes accumulated from American business, and under the protective tariff policy, was that of Andrew Carnegie, one of the most useful of our great citizens. Based upon his contention that "to die rich was disgraceful" he established many institutions calculated to be of great public service. Among these was the Carnegie Endowment for International Peace. This institution apparently forgetting that its endowment was created by a fortune developed under the American protective policy is now assailing that policy, as a "throw-back to an age of savage conquest."

Mr. James T. Shotwell, director of the Division of Economics and History of that institution, in a discussion of his theories of "The Difficulties of Enduring Prosperity" and with special reference to the Tariff Act of 1928, says: "A handful of men, sitting around a table in Washington in an atmosphere heavy with ignorance and cigar smoke, crippled the chief industry of a country three thousand miles away."

This handful of men is the Congress of the United States and this atmosphere "heavy with ignorance" was in the legislative halls of the greatest nation in the world.

The country referred to is Switzerland which has been shipping to the United States approximately eleven million dollars worth of watches and watch movements every year.

As a matter of fact the increased duty upon Swiss watches and watch movements will not, to any appreciable extent, prevent importations. The 1922 tariff law was opposed by importers in almost the same language employed against the law of 1930. It was then asserted that the then proposed 1922 law would amount to a virtual embargo. However, under this law, imports grew from 2,453,432 watches and movements in 1925 valued at \$7,122,518 to 5,073,740 watches and movements in 1929 valued at \$11,434,809.

These are foreign valuations and if translated to American valuations it would seem that the Swiss manufacturers are absorbing about 60 percent of the American market while the American watch manufacturers are employed to only 50 percent of capacity.

Watch movements are brought into this country and sold at prices calculated to drive out of business the great watch manufacturing companies with their thousands of employes at wages nearly double the wages paid in Switzerland. Mr. Shotwell believes that because of a slight increase in tariff that we shall gain the enmity of other nations and, we should let down the bars to cheaper foreign production and force more of our American workmen out of employment. Mr. Shotwell denies the statement of Hancock that "the tariff is a local issue" and says the tariff "is not even a national issue; it is an international issue which should be handled by some kind of international technique."

It is hard to believe that a man occupying so prominent a position can be so ignorant of the facts, as Mr. Shotwell's statement indicates, or that any citizen of any country can be so unpatriotic as to suggest that the sources of prosperity of his own country shall be turned over to the control of foreigners. No country in the world today, as Mr. Shotwell urges, should "submit to economic disarmament."

The Carnegie Endowment for International Peace instead of helping to stabilize world conditions and create fair competitive conditions in the world's markets, would

allow our competitors to control our economic affairs, take command of our markets, close down our own factories as a means to carrying out the purpose of the Carnegie Endowment for International Peace.

The next step would be to invite the military authorities of foreign countries to officer our army and dictate the policy of our navy.

This institution, instead of being an influence of good throughout the world is likely to become a common nuisance in the country of its birth.

Coal

AS A PEOPLE we think in big terms. Vast sums are bandied about casually—millions, billions, trillions—and, like Andy of radio fame, we seldom stop to consider either the sums or what is really back of them.

A considerable amount of this wealth is based upon natural resources. The coal industry, for example: In this industry there is a capital investment of more than twelve billion dollars! With that investment is produced five hundred and fifty million tons (more or less) annually, which is worth at an average cost of \$1.50 per ton, almost a billion dollars. This industry, in order to produce this tonnage, must spend better than a hundred million dollars annually for equipment and supplies.

We have something like 6,000 mines producing this tonnage. But only about 2,000 of them really enter into the picture as producers. The 2,000 mines produce about 90 percent of all of the coal used. These 2,000 mines are owned by less than 300 companies. It is the extra 4,000 mines that have caused the downfall of coal as an industry and earned for it the sobriquet of "the prodigal son of industry."

Faced with competition from within and from without; faced with the eternal cry for cheaper fuel, it is small wonder that coal is conspicuously in the red. Competition, over-production and stagnant markets have harrassed the coal industry for many, many months. Its progress in spite of these handicaps is indeed marvelous.

Coal does not deserve all of the criticism levelled at it. It is giving this country an amazingly cheap fuel and the cheapest power in the world. It employs thousands of workers with an annual pay roll of half a billion dollars and spends millions in supplies and equipment, which in turn create other industries, employing more labor. Its by-products furnish the basis for still greater industries. And first, and foremost, it is diligently trying to solve its problems.

At Cincinnati, Ohio, this year—May 11 to 15—some 3,000 operating men, traveling varying distances from every part of the United States, will gather to participate in a five-day program especially designed to assist them in producing coal safely, efficiently and economically. At the same time this great delegation will view a magnificent exposition of equipment and supplies, an exposition occupying some 50,000 square feet of floor space and presenting everything for efficient production from ball bearings to locomotives; from loading machines to grease.

All of those who gather at this meeting—operator and manufacturer—form a great cooperative association, whose sole purpose is the advancement of coal mining methods. The week of May 11 is something that the critics of coal might seriously consider before becoming too verbose.



The FLOW of BITUMINOUS COAL into Industry and Trade¹

By C. P. White² and F. G. Tryon³

FEW commodities have so wide and so varied a market as coal. As an article of direct consumption it is distributed almost as widely as bread and meat, and as a source of industrial power and heat it is bought by a greater number of consumers than any other raw material of commerce. The United States numbers at least 90,000 buyers of coal in carload lots, to say nothing of some hundreds of thousands of smaller industrial consumers who are served by truck from retail yards.

The sales manager of an individual company may know who consumes his own tonnage, but naturally has little idea of the exact requirements of the many thousands of buyers with whom he has no direct contact. Yet he needs a bird's-eye view of the principal features of consumption when planning his own sales campaign or in gauging the future possibilities of the market. Requests for information of this kind are so frequent that the Bureau of Mines has developed

a special analysis of the current trend of consumption which is published in the *Weekly Coal Report* and the new *Monthly Coal Market Summary*. This article assembles some of the high lights of the picture as developed by H. O. Rogers, R. W. Metcalf, and other members of the Coal Division, which may be useful as a background for those who follow the short-time changes of consumption in the current reports. To avoid confusion, the present study is confined to bituminous coal only.

The total production of soft coal in the United States ranges from 440 to 579 million tons a year, the average for the last eight years being just about 520,-

000,000 tons. However, production alone is not a safe guide to the national requirements, because of two complicating factors—(1) the flow of coal in and out of storage, and (2) the occasional violent changes in the export demand. To determine the trend of consumption these two disturbing elements must first be eliminated.⁴

How great the movement in and out of storage sometimes may be even seasoned coal men are apt to forget. Three times in the modern history of the coal market the net increase in consumer's stocks has been more than 22,000,000 tons in 12 months. At other times the flow may be reversed, and in one year a veritable flood of 35,000,000 tons poured out of storage and into the market. Probably no single factor has more influence on market conditions than the changes in stocks, and the bureau's quarterly survey of consumers' stocks is designed to measure this factor.

Changes in exports, too, may obscure the trend of consumption. The shipments to Canada are relatively steady, and tend to follow the domestic market, because business conditions on both sides of the international boundary are usually alike. The fluctuations occur chiefly in



¹ Published by permission of the Director, U. S. Bureau of Mines (not subject to copyright.)

² Chief, Economics Branch, U. S. Bureau of Mines.

³ Economist, U. S. Bureau of Mines.

⁴ *Weekly Coal Report*, April 4, 1931, p. 5. Production, imports, exports, and home consumption of anthracite and bituminous coal, 1918-1930.

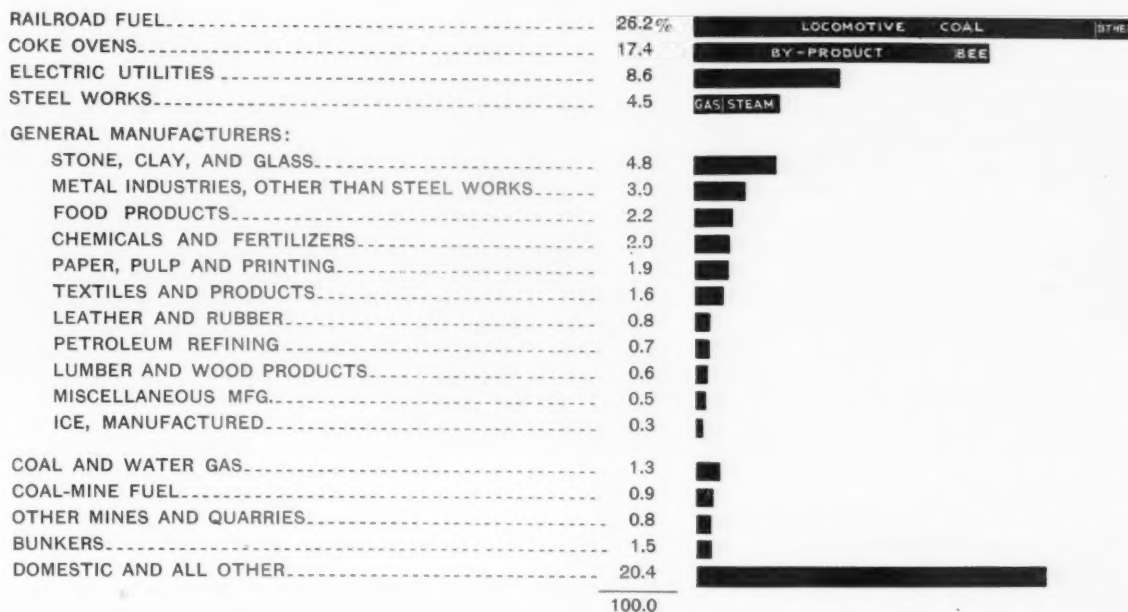


Figure 1—CONSUMPTION OF BITUMINOUS COAL BY USES IN A YEAR OF INDUSTRIAL ACTIVITY

In general, the data plotted in this chart represent 1929, the latest year for which business was conspicuously active. For general manufacturing, however, it was necessary to use 1927, the latest year covered by the Census of Manufacturers for which complete information is available.

Note that the item "domestic and all other" includes, besides houses, the heating of large buildings other than factories, such as hotels, apartments, stores, offices, theaters, garages, and service stations. It also includes small industrial consumers not covered by the Census of Manufacturers.

the sea-borne exports, which have been as low as 1,500,000 tons a year and as high as 21,500,000 within the last decade. The need of allowing for stocks and exports is well illustrated by the year 1926. Those who watched the course of the coal industry in that year saw production climb almost to the war-time maximum, and some persons believed that demand had turned the corner and was at last catching up with the capacity of the mines. Observers who looked beneath the surface, however, soon saw that if one discounted the overseas exports and the flow of coal into storage, consumption in 1926 did not differ greatly, after all, from that in other years of active business. What increase it did show was largely explainable by the abnormal demand for house coal caused by the great anthracite strike.

For these reasons the national consumption fluctuates much less violently than production. In the boom year 1929 it was 519,555,000 tons, while in 1930, a year of acute depression, it amounted to 449,000,000 tons, and these figures appear likely to stand for some time as the upper and lower limits of consumption.

In a typical year of normal activity the national consumption now totals about 500,000,000 tons. Figure I shows how this total is apportioned among the

principal branches of consumption. Details are given in a recent issue of the *Weekly Coal Report*.⁵ By far the largest consumers are the steam railroads, which take 26.2 percent of the total. This per-

centage includes not only locomotive coal but about 12,500,000 tons used at shops, roundhouses, stations, and office buildings. Next in order come the coke ovens, which absorb about 17 percent of the



Figure II—TONNAGE OF BITUMINOUS COAL ABSORBED BY THE PRINCIPAL BRANCHES OF CONSUMPTION, 1917-1930

The diagram shows that although there has been no great change in the aggregate consumption of bituminous coal during the past 14 years, shifts have occurred in many of the important uses. A marked decline has taken place in the consumption of colliery, bunker, and locomotive fuel, but these losses have been offset through increased consumption by the electric public utilities. The total quantity used for coke making at present is not greatly different from that in 1917, but the relative position of the beehive and by-product ovens has been reversed. In the group of "all other uses," a decline in manufacturing consumption has been offset by an increase in consumption for domestic use.

⁵ Tryon, F. G., and Rogers, H. O., Consumption of bituminous coal by uses in a typical year of industrial activity, *Weekly Coal Report*, April 11, 1931.

total. The electric utilities rank third in importance. In spite of phenomenal advances in fuel efficiency consumption of coal by the electric public utilities is increasing. In 1929 nearly 43,000,000 tons of bituminous coal, or 8.6 percent of the national total, was used at central stations in the generation of electric power.

In a year of industrial activity the iron and steel industry consumes 8 or 9 million tons of gas coal and 14 or 15 million tons of steam coal in addition to the coking coal charged in its by-product ovens. Its consumption of gas and steam coal combined amounts to 4.5 percent of the national total. For general manufacturing the latest figures available are those of the Census of 1927. In the aggregate this great group of industries burns about 92,000,000 tons a year, or 18.4 percent of the total. The diagram subdivides the group into 11 major divisions, ranging from the stone, clay, and glass products industries, with 4.8 percent of the total, down to manufactured ice, with 0.3 percent.

Because of the special quality of the coals used in gas manufacture the requirements of the gas industry are more important than the tonnage consumed indicates. In 1927 the consumption of coal in the manufacture of both coal gas and water gas amounted to a little over 6,000,000 tons, or 1.3 percent of the total. The future of this industry, however, is somewhat uncertain, partly because of the recent developments in long-distance transmission of natural gas and partly because of the increasing use of surplus coke-oven gas by the city gas companies.

Other small items in the budget are fuel for coal mines, for other mines and quarries, and for ships' bunkers, each of which accounts for approximately 1 percent of the total.

There remains a residue designated as "domestic and all other uses," which



amounts to approximately 102,000,000 tons, or 20.4 percent of the grand total. This item is obtained by subtracting the other known items from the known total, the result being checked against all available information as to the magnitude of the uses it includes. Besides the heating of homes and apartments it covers the heating of all large buildings other than factories, such as hotels, stores, office buildings, theaters, public schools, garages, service stations, steam laundries, etc. It also includes a number of items on which accurate data are not available, such as city water works, central heating plants, the construction industry, threshing engines, and the requirements of very small industrial consumers not covered by the census of manufactures.

Just how much of this total is used for domestic purposes is not definitely known, but, whatever it may be, all indications point to the conclusion that it is increasing.

Many of the items in the budget—such as consumption by the 200,000 manufacturing plants covered by the census—can be measured only at great expense, and it is not feasible to canvass them every year. A number of the largest items, however, are covered regularly, sometimes even monthly. Figure II brings together the record for all items that are known definitely in each year. In this diagram the deceptive influence of changes in stocks is eliminated, and the columns represent the actual tonnage exported or consumed in each year. The outstanding features of the export trade, which is plotted separately at the top, are the comparative steadiness of the black zone, representing the movement to Canada, and the sudden changes in the white zone, representing the movement overseas. The years of heavy sea-borne exports were 1920 and 1926, and in both years the cause was an unexpected and abnormal shortage of supplies in Europe

CHANGES IN THE UNITED STATES CONSUMPTION OF BITUMINOUS COAL BY SUCH CLASSES OF CONSUMERS AS REPORT CURRENTLY, AND BY ALL OTHER CONSUMERS, 1917 TO 1930, IN THOUSAND NET TONS

(Information on several other classes of consumers is available for certain years. The items shown in this table are selected because they are available in strictly comparable form for each year)

Year	Consumed in the United States							Exported		Total of consumption and exports <i>g</i>	
	Colliery fuel	Electric public utilities <i>a</i>	Bunkers, foreign trade <i>b</i>	Locomotive fuel Class I roads <i>c</i>	Coke—beehive ovens <i>d</i>	Coke—by-product ovens <i>d</i>	All other uses <i>e</i>	Total consumption <i>f</i>	To Canada and Mexico		To other countries (sea-borne)
1917	12,117	33,500 <i>A</i>	7,709	133,421	52,247	31,506	258,909	529,409	18,327	5,512	553,248
1918	12,521	34,500 <i>A</i>	6,189	134,214	48,160	36,868	258,141	530,593	18,316	4,034	552,943
1919	11,062	35,100 <i>A</i>	8,224	119,692	29,730	35,857	241,993	481,658	12,064	8,050	501,772
1920	11,896	37,124	10,486	135,414	31,986	44,205	237,484	508,595	16,458	22,059	547,112
1921	9,123	31,585	8,453	107,910	8,475	28,713	197,590	391,849	13,590	9,541	414,980
1922	7,831	34,179	4,615	113,163	13,286	41,053	212,788	426,915	10,938	1,475	439,328
1923	8,765	38,966	5,093	131,492	30,084	54,276	250,317	518,993	16,960	4,494	540,447
1924	6,618	37,556	4,460	117,247	15,914	49,061	253,148	484,004	12,746	4,354	501,104
1925	5,776	40,222	4,866	117,714	17,423	57,110	256,082	489,193	13,547	3,915	516,655
1926	5,728	41,311	7,736	122,823	19,225	63,647	272,111	532,581	13,762	21,510	567,853
1927	4,930	41,888	4,565	115,893	11,208	63,240	256,087	499,801	14,724	3,288	517,813
1928	4,602	41,350	4,294	112,382	7,018	70,166	259,016	498,828	14,050	2,114	514,992
1929	4,663	44,937	4,287	113,894	10,028	76,759	264,987	519,555	14,727	2,702	536,984
1930 (preliminary)	4,050	42,897	3,497	96,650	4,370	66,177	231,453	449,094	13,667	2,210	464,971

(a) U. S. Geological Survey. Includes a small amount of anthracite. (b) Bureau of Foreign and Domestic Commerce. (c) Interstate Commerce Commission. (d) U. S. Bureau of Mines. (e) Obtained by subtracting the known items from the calculated total consumption. Includes general manufacturing, domestic, and many miscellaneous uses. From other sources it is known that consumption in steel works and general manufacturing is decreasing and that consumption for domestic uses is increasing. (f) Production plus imports minus exports, plus or minus changes in consumers' stocks. (g) Note that consumption includes the small amount imported. (h) Estimated from 1917 Census of Electrical Industries and incomplete data.

that resulted from stoppage of the usual exports from Great Britain.

Ranged below the exports in Figure II appears consumption in the United States, subdivided by uses. In this way the diagram indicates clearly the great depression of 1921-22, the boom year of 1923, the reaction of 1924, and the subsequent fluctuations, culminating in the boom of 1929 and the depression of 1930. Many observers of the market will be surprised to note that the decrease in consumption from 1929 to 1930 was only 13.6 percent. For industry in general the decrease in 1930 averaged 22 percent,⁶ indicating that bituminous coal was affected less by the slump than many other lines of business.

The changing requirements of the major branches of consumption can be read from year to year in the shifting bands of the diagram. The item of colliery fuel, never large, has decreased steadily as more and more mines have shut down their own boiler plants and turned to central-station power. This change is one cause, though not the most important one, of the increase in the consumption of the electric utilities, an increase which would be much greater were it not for the advances in fuel efficiency already noted. Consumption for bunker purposes has been pinching out steadily, largely because of the competition of fuel oil.

The effects of fuel economy are shown strikingly in the demand for locomotive fuel. In spite of an increase in traffic handled the carriers are using less coal today than during the war. In part the decrease represents the inroads of fuel oil, but to a much greater degree it is caused by the steady decline in unit consumption per 1,000 ton-miles of service.

Consumption for coke manufacture, on the other hand, has held its own, if one looks at the combined requirements of both types of ovens, but the shift from beehive to by-product ovens is perhaps the most striking change registered by the diagram. In 1917 the quantity charged in beehive ovens was 52,247,000 tons. By 1930 it had narrowed to 4,370,000 tons. Viewing the country as a whole, expansion in by-product ovens has fully offset the shrinkage in beehive. However, the shift has not affected all mining districts in like degree, and the rise of the by-product oven has been one of the significant factors in the growth of the southern coal fields.

What of the great unclassified "all other uses"? In Figure II this includes the big items of manufacturing and domestic requirements as well as miscellaneous uses. The total for all the items

in this blanket group has shown curiously little change. In 1917-18 it averaged 258,000,000 tons and in 1928-29 about 263,000,000. There is no doubt, however, that consumption in manufacturing has been declining, and that, on the other hand, consumption for domestic purposes has been increasing. The growth of population and higher standards of comfort have resulted in greater and greater consumption of coal for keeping people warm, and the increase has gone not to anthracite but to bituminous coal. Here is one branch of the national budget in which prospects for expansion are favorable. Progressive coal men may see in the domestic market one of the chief hopes of increased tonnage.⁷

BIBLIOGRAPHY OF BUREAU OF MINES COAL INVESTIGATIONS

The numerous contributions to the literature of coal made by the members of the technical staff of the United States Bureau of Mines are listed in Technical Paper 493, "Bibliography of United States Bureau of Mines Investigations on Coal and Its Products, 1910-1930," by A. C. Fieldner and M. W. von Bernewitz, recently published. One of the principal functions of the Bureau of Mines is investigation of the efficient production and use of solid, liquid, and gaseous fuels and their by-products and publication of the findings thereon. The study of fuels, particularly coal, was begun in 1903 by the technologic branch of the United States Geological Survey, which was merged into the Bureau of Mines when it was organized in 1910. This bibliography on coal and its products includes publications issued by the Bureau of Mines and those written by its staff for the technical press, which includes the chemical and engineering periodicals of scientific bodies. Under this head are included reports of work done jointly with states and colleges.

The papers on coal and its products are separated into the class of publications and arranged alphabetically by authors. The publications of the Bureau of Mines comprise bulletins, technical papers, miners' circulars, reports of investigations, information circulars, and special reports.

In addition, this bibliography includes references to papers on the economics and statistics of coal and coke issued by the economic branch of the Bureau. This branch was organized shortly after July 1, 1925, when the former mineral resources division of the United States Geological Survey was transferred by Executive order to the Bureau of Mines.

Copies of Technical Paper 493 may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at the price of 10 cents.

NON-FATAL COAL-MINE ACCIDENTS TO BE STUDIED

A nation-wide canvass of coal mines to determine the number and causes of non-fatal accidents that occurred in 1930, is being conducted by the United States Bureau of Mines. Already reports have been received from half of the operating companies, according to Scott Turner, director of the bureau. Reports on fatal accidents have been collected by the bureau for many years, but it was felt that more information on non-fatal accidents was required in order further to promote safety in coal mining. Mr. Turner estimated that more than 100,000 men are injured by accidents in coal mines each year. About 2,000 of these injuries result fatally.

While tabulations to date do not cover all returns received, they have progressed far enough to reveal some very interesting facts. For example, the tabulations cover the production of more than 275,000,000 tons of bituminous coal and over 27,000,000 tons of anthracite during the calendar year of 1930. To produce this tonnage, 270,000 bituminous miners and 62,000 anthracite miners were employed. The men averaged 195 workdays in bituminous mines and 204 workdays in anthracite mines. Average daily output of coal per employe was 5.2 tons in bituminous mines and 2.1 tons in anthracite mines.

With this amount of production the returns for bituminous mines showed 2.6 deaths and 142 non-fatal injuries for each million tons of coal produced; similar records for anthracite mines showed 7.8 deaths and 530 non-fatal injuries for each million tons.

Assuming an 8-hour day at all mines, which, while not absolutely correct is sufficiently accurate for comparison, the records showed 95 accidents of all kinds, both fatal and non-fatal, for each million man-hours of work performed at bituminous mines and 144 accidents for each million man-hours at anthracite mines. These figures are based on reports covering all "lost-time" accidents, which means all accidents that disabled an employe for more than the remainder of the day on which the accident occurred. For each death in bituminous mines the returns thus far received revealed 54 non-fatal injuries; corresponding records for anthracite mines showed 68 injuries for every fatality.

Bituminous mines produced 378,000 tons of coal for each fatality and 7,000 tons for each non-fatal injury. The production in anthracite mines averaged 128,000 tons for each fatality and 1,900 tons for each injury. Out of a total listing of 9,285 bituminous and anthracite mines, the returns thus far received have revealed 1,310 mines either idle, abandoned or dismantled.

⁶ Federal Reserve Bulletin, February, 1931, p. 68.

⁷ Details of the items shown in Figure II are given in the Weekly Coal Report, April 18, 1931: Changes in annual consumption of bituminous coal for known uses and for all other purposes, 1917-30, by R. W. Metcalf.

COAL UTILIZATION, Present and Future— its relation to increased consumption

By F. R. Wadleigh*

"SCIENCE is just beginning to reveal coal as destined to become the foundation for vast industrial chemical operations. . . . There are under development uses for coal certain to be of vast importance to civilization, since they will assure indefinitely certain essential commodities. . . . Coal is destined to be the most important raw material ever available to chemical industry."

The foregoing quotations are taken from a recent report to the Engineering Foundation, made by Mr. Chaplin Tyler, a research supervisor of the du Pont Ammonia Corporation, and may be presumed to give the viewpoint of the chemist with regard to the future of coal and its value to civilization and industry.

While we may agree with the opinions expressed as to the future, it is difficult to see any new developments in the use of coal that will lead to an immediate increase in consumption, although improvements and changes in old uses bid fair to bring about a widening of markets and more diversified distribution.

As regards the future, consider the prediction made by Dr. Millikan last December that eventually the world's power needs would be supplied directly by the sun; and only recently Dr. Bruno Lange, German scientist, has invented a new device, in the development of a silver-selenide cell, by which, it is claimed, sun

energy can be obtained at a cost within close range of that of a hydro-electric plant.

There are, however, at least two obstacles to be overcome, as stated by Prof. H. H. Sheldon, before this source of energy can be made available to any degree; one, the question of space, based on the estimate that it would take a square mile of surface to generate 300,000 kw. of energy; the other, that of power storage to handle the load at night or on cloudy days.

So much for the future, omitting the possibility of useful production of atomic energy, at present a dream of the physicist, but which, like other dreams, may become true.

Today what hope for increased utilization of coal can be seen in present known and tested directions? Are there any really new uses of coal on the horizon that are likely to bring about any marked and important increases in coal consumption?

The addition of new commercially valuable by-products obtained from coal carbonization and the finding of wider uses for those already known will certainly make up one field in which we may confidently expect an increased demand for coal, but it is probable that such increase will be rather small as regards actual tonnage used. In any other direction the immediate prospect for an increase in coal consumption is rather dim, except, of course, as it may be brought about by increased industrial activity and demand and by successfully combating the inroads of other fuels.

It would seem, therefore, that what the coal industry needs is the discovery and development of new uses and new methods of use; these can be discovered only by study and research, pure and

commercial; a fact which the coal industry, as a whole, seems to pay little attention to; unlike the consumers, who are much more active, to say the least, in actual coal research work.

What new uses or improvements in use will be brought about through the immense amount of coal research now going on and projected is, of course, problematical, but it is hard to believe that much in the way of new knowledge and new uses for coal will not result.

Take, for instance, the recently announced preliminary program for the new coal research laboratory of the Carnegie Institute of Technology. While no complete schedule of the proposed work has been announced, it has been stated officially that studies of high vacuum distillation and the mechanics of thermal decomposition of coal, dealing with the reactions that take place when coal is subjected to heat, will be early subjects of study. As Dr. Baker, president of the Institute, has stated, the work of the laboratory will be devoted to fundamental research in coal, and efforts will be directed toward securing basic chemical and physical data which can be utilized by those who study coal from the point of view of the practical man.

To carry on the work of the laboratory, funds have been subscribed, totaling \$425,000 over five years. Of the six firms subscribing, four are users of coal and two both producers and users. In addition to an advisory board, a technical committee has been appointed, on which there is one member entirely identified with the coal industry. The whole project will undoubtedly prove to be of great value to all who are interested in the use and production of coal.

About four months ago an advertisement appeared in the bulletin of a well-

* Consulting Mining Engineer, Washington, D. C., and New York City.



known agency, which read as follows, under the heading of positions open:

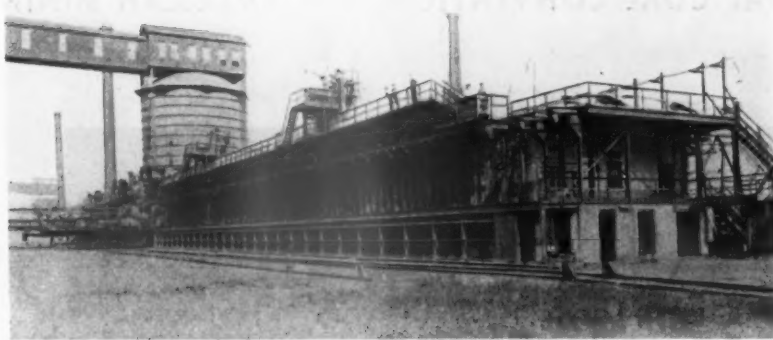
"Engineer with chemical and metallurgical training, to head up the research department of a large coal mining and merchandising organization. Will be in charge of the company's laboratories, research works, and engineers, and will manage and coordinate all research activities of the entire organization, in an effort to discover *new uses for coal*. This experience essential. Must be a man of vision and ideas. Salary, \$15,000-\$20,000 a year."

It would appear from the foregoing that at least one coal company realizes that there is a definite need for finding new uses of its product and is ready to finance and carry on the work required for their finding and development. But, it may be asked, if the coal industry needs—as everyone will admit—new uses and new markets, why does it not, as a whole, find a way of giving the necessary impetus and finances to a study of the subject?

There is no matter of more importance to the industry today than the finding of means and methods for increasing the consumption of coal, and a thorough and systematic search for new uses and new use equipment offers strong possibilities in that direction.

Surely, if the studies suggested (and they would necessarily include the finding of additional means for retarding the growing use of other fuels) are so important, so vital to its future welfare, the industry might well afford to raise sufficient funds for at least a couple of years' work; any action that will enhance both the value and consumption of coal is surely worth the expenditure of time, money, and thought for the benefit of the industry. A small fraction of 1 cent per ton of the country's annual production would provide ample funds with which to obtain the required equipment and personnel with which to carry on a thorough investigation.

We must remember that it is many years since a really new



realized and acted upon by all of the principal trades in this country and abroad, and to no industry is it more

important than to coal, nor is there any that holds such promising rewards for thorough study or so many problems for solution.

major use of coal has been commercially developed in this country, at least. The use of pulverized coal as a ship's fuel and the use of small stokers, new *methods* of use, are really adaptations of old uses; low temperature carbonization of coal may be called a new use, but, in this country, needs much greater development before it can be considered successful commercially; hydrogenation of coal, also a new use, is a long way in the future, as regards the United States.

"Commercial progress in industry has always been measured by the advance in knowledge of those engaged in it. The knowledge of an industry that is essential to its success must embrace all facts and circumstances that will in any way influence that industry. These facts and circumstances must include economic conditions, as well as scientific facts, to the extent that science is called into play in its operation and in all commercial conditions that make for efficient production, merchandising, and distribution."—Herbert Hoover.

Research has given us every great industrial discovery and has immeasurably increased the number of uses of coal, and hence widened its distribution and markets. There is no major industry that can afford, in these days, to function without research, a conclusion which is

realized and acted upon by all of the principal trades in this country and abroad, and to no industry is it more

A more practicable and profitable field can hardly be found for the coal industry than that included in research, thorough, intelligent, and continued, not only in technical matters but also in marketing and distribution, with a close coordination of the three branches. "Leaving aside routine work and pure research, there is still a wide field of research that can reasonably be expected to lead to developments in the industry concerned, and ultimately to commercial profits for which the industry exists. It is this kind of research which is meant when speaking of 'commercial research.'"—R. A. Burrows.

One of the most important needs of the coal industry—perhaps the most important—is to increase the consumption of coal. To accomplish this result there are three leading activities which need the closest attention: Improvement in marketing methods, combating the use of other fuels, and finding new uses and new methods of use.

The preparation and treatment of coal is another one of the industry's activities that is intimately connected with coal utilization, as is well known to both consumers and mine operators.

The cost of efficient preparation is not small, but it will pay for itself in the long run and, whether or no, as consumers are demanding clean coal and the coal industry will have to furnish it, if their product is to be utilized to the fullest and most profitable extent.

Increased markets are, therefore, dependent upon increased utilization, and the latter upon more efficient use, the finding of new uses, improved equipment and methods, together with properly prepared coal that is suitable to the use for which it is intended and sold.





The COAL

R. E. TAGGART
*National Chairman of
the Program Committee.
Vice President of the
Stonega Coke and Coal Company*

INDUSTRY at CINCINNATI

THE fate of the 1931 Cincinnati meeting of the coal-mining industry, sponsored each year by The American Mining Congress, is now in the lap of the gods. The Program Committee has completed its five-day program, and the result has received industry-wide approval. Ralph E. Taggart, chairman of the Program Committee and vice president of the Stonega Coke and Coal Company, and his committee of 83 operating men are to be congratulated upon the type of program they have been successful in arranging. It is replete with interest from start to finish and offers possibly the greatest variety of subjects ever presented at these meetings. Safety in its many phases is given the lion's share on the program. Three full sessions will discuss various problems in connection with safe production. Mechanical mining in thick and thin seams,

coal cleaning, and a session on recent developments in mining practice go into the hopper. The men who will present the papers are men of accomplishment. These Cincinnati meetings do not specialize in speculation and theory; they are devoted strictly to fact and result.

That the 1931 meeting will live up to the splendid record of its predecessors is a foregone conclusion. Information available at the official headquarters, The American Mining Congress, indicates that the attendance will be on a par with the record-breaking meeting of 1930. The reports from the leading hotels in Cincinnati indicate that they are booked to capacity.

DISTRICT CHAIRMEN OF THE PROGRAM COMMITTEE



W. D. Brennan



E. H. Suender



Thomas G. Fear



Milton H. Fies



George F. Campbell



V. C. Robbins



P. C. Graney

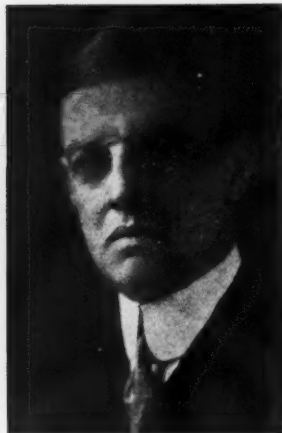
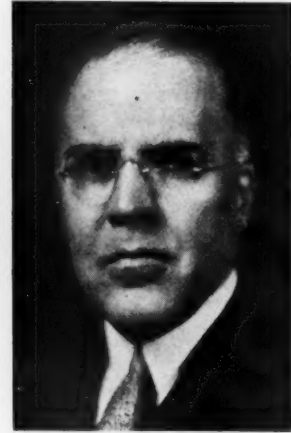
EIGHTH ANNUAL COAL CONVENTION—THE AMERICAN MINING CONGRESS

**A. B. Jessup****Cadwallader Evans, Jr.****R. E. Hobart****T. D. Lewis****B. H. Stockett**

This is indeed a gratifying situation. It indicates many things, first among them being that the coal industry is in dead earnest in the working out of its problems, and second that these meetings are appreciated for their real worth . . . a great progressive school of coal-mining practice.

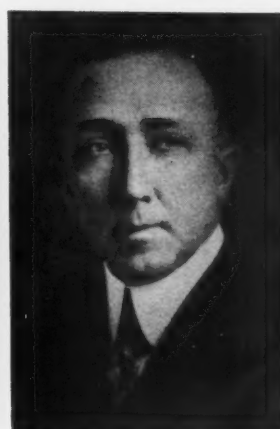
Mr. Taggart inaugurated a new plan in the development of the program this year. He appointed district chairmen to serve with him, and made these men responsible for the suggestions emanating from their particular sections. Special meetings were held in each section, which were largely attended, and recommendations for papers of peculiar interest to that section were made. A final meeting of the entire committee was then arranged for, and the suggestions from each section given full consideration in the accepted program. The result, of course, is that this year's meeting has a very wide appeal and carries much of interest to every section, whether they are mechanically minded or are solving their problems by other means.

These Cincinnati meetings have been founded and have grown upon the idea of cooperative effort. The industry has

**A. L. Hunt****F. B. Dunbar****Paul Sterling****D. E. Ingersoll****Newell G. Alford**

MEMBERS OF THE

EIGHTH ANNUAL COAL CONVENTION—THE AMERICAN MINING CONGRESS

*P. C. Thomas**E. J. Newbaker**L. E. Young**C. W. Gibbs**A. J. Musser*

been generous with its response both with cooperative effort in arranging the program and in the presentation of papers. In all, the total number of operating men actually taking active part in the development of this year's meeting is 140, representing 112 companies, whose annual production amounts to better than 350,000,000 tons.

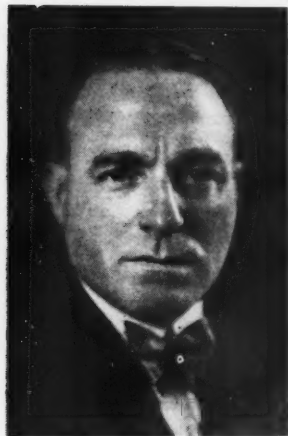
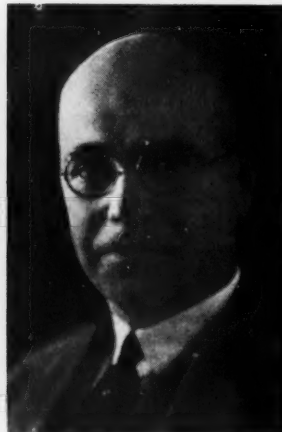
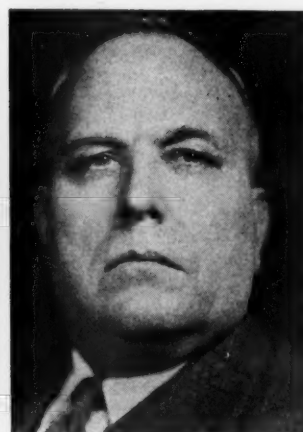
The convention will open on Monday, May 11, at Music Hall, Cincinnati, Ohio, with the important discussion of "Trends Toward Better Management." Certainly the coal industry, along with all other industry, can afford to analyze its management problems. It is expected that much of interest will be developed at this session. Equally the afternoon session, which will discuss safe operating practice, with special reference to "personnel training," offers a fertile field for interesting discussion. Rules are easily made, but the enforcing of them is the question of great moment. This session will present the views of a considerable group of operators on how this is being accomplished. Monday, the opening day, promises to be one of the most interesting of the entire meeting.

On Tuesday mining systems throughout the various mining districts will be presented, as well as important phases

*T. R. Johns**D. D. Dodge**J. W. Bischoff**W. P. Vance**W. J. Heatherman*

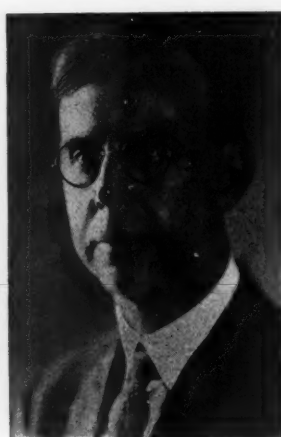
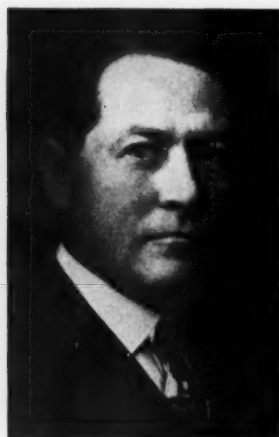
PROGRAM COMMITTEE

EIGHTH ANNUAL COAL CONVENTION—THE AMERICAN MINING CONGRESS

*A. B. Kelley**M. D. Cooper**W. P. Cayton**Ezra Van Horn**E. J. Christy*

of the use of mechanical mining in thick coal. Wednesday morning gives the anthracite industry a special inning, and at this session the problems of anthracite will have full sway. At the afternoon session safety will again be the topic for discussion . . . safety with mechanical mining . . . cost of accidents, and various phases of this important subject will be presented by men who are solving them. On Thursday mechanical mining in thin coal and recent developments in mining practice will be discussed. The latter subject is new to the Cincinnati program and presents some of the most interesting of the recent developments within the industry. Friday, the closing day, will discuss coal cleaning, and last but not least, fuel utilization. The latter session is a complete innovation for this meeting. It is being sponsored by the "Committee of Ten" and the management is attempting to arrange a stoker exhibit which will be enlightening and interesting.

In the development of the program Mr. Taggart has had special assistance from the district chairmen. Mr. E. H. Suender, of Madeira, Hill & Company has served as chairman for the Anthracite Section; Mr. Geo. F. Campbell, of the Old Ben Coal Corporation, chairman for the Illinois-

*C. A. Griffith**L. C. Skeen**L. B. Abbott**T. E. Jenkins**H. S. Gay, Jr.*

MEMBERS OF THE

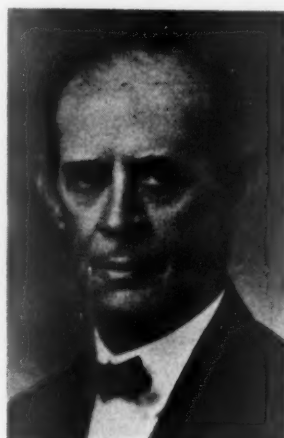
EIGHTH ANNUAL COAL CONVENTION—THE AMERICAN MINING CONGRESS

*G. T. Stevens**H. B. Husband**H. D. Smith**Chas. W. Connor**Thos. H. Clagett*

Indiana Section; Mr. Thos. G. Fear, of the Consolidation Coal Company, chairman for the Pennsylvania (bituminous)-Northern West Virginia-Ohio Section; Mr. P. C. Graney, of the C. C. B. Smokeless Coal Company, chairman for the Southern West Virginia-Virginia-Eastern Kentucky-Tennessee Section; Mr. Milton H. Fies, of the DeBardeleben Coal Corporation, chairman for the Southern Section; Mr. V. C. Robbins, of the McAlester Fuel Company, chairman for the West Central Section; and Mr. W. D. Brennan, of the Utah Fuel Company, chairman for the Far West Section.

Chairmen for the various sessions, as announced by Mr. Taggart, are as follows: Mr. Harry N. Taylor, of the United Electric Coal Companies; Mr. P. M. Snyder, of the C. C. B. Smokeless Coal Company; Mr. Robt. J. Smith, of the Princeton Mining Company; Mr. T. T. Brewster, of the Mt. Olive & Staunton Coal Company; Mr. E. H. Suender, of Madeira, Hill & Company; Mr. C. M. Lingle, of the Buckeye Coal Company; Mr. H. L. Warner, of the Kanawha & Hocking Coal & Coke Company; Mr. C. F. Richardson, of the West Kentucky Coal Company; and Mr. Erskine Ramsay, of the Alabama By-Products Corporation.

In addition to the program of serious moment, is the pro-

*T. C. Mullins**C. P. Moore**James A. Long**W. F. Davis**G. E. Lyman*

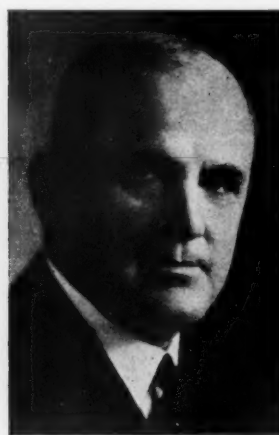
PROGRAM COMMITTEE

EIGHTH ANNUAL COAL CONVENTION—THE AMERICAN MINING CONGRESS

*F. S. Pfahler**D. A. Thomas**C. E. Abbott**C. T. Hayden**P. L. Donie*

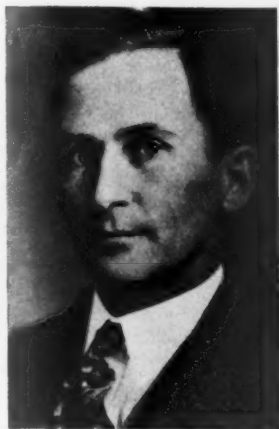
gram of entertainment, which will include the usual delightful informal dinner and dance. A special complimentary breakfast will be tendered Mr. Taggart, and group luncheons will be held of the chairmen of the National Committee on Mechanized Mining, and the Manufacturers' Division of The American Mining Congress.

This convention and exposition offers an unparalleled opportunity to the coal industry. The industry needs real help, and this is one place where it may be found. Arrangements again this year have been carried on under the general direction and supervision of The American Mining Congress, which for eight consecutive years has been sole sponsor for this event. The program has been directed by Mr. Taggart, and the exposition has been developed by the Manufacturers' Division of The American Mining Congress under the direction of Mr. Fred J. Maple, advertising manager, The John A. Roebling's Sons Company, and chairman of the division. The General Electric Company has again loaned the services of its Mr. L. W. Shugg as director of exhibits, and E. R. Coombes, of the general staff of The American Mining Congress and editor of the MINING CONGRESS JOURNAL, has

*H. H. Taylor, Jr.**C. J. Fletcher**C. J. Sandoe**Ira Clemens**K. A. Spencer*

MEMBERS OF THE

EIGHTH ANNUAL COAL CONVENTION—THE AMERICAN MINING CONGRESS

**Chas. Gottschalk****Hugh Shirkie****W. J. Jenkins****J. D. Zook**

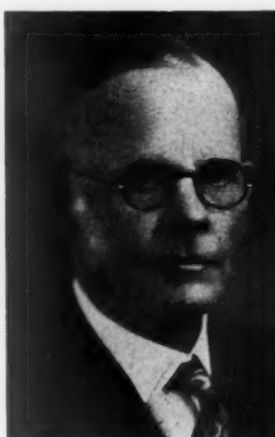
served as secretary of the Program Committee and convention manager.

The operator fortunate enough to attend this year's meeting will be well repaid. The industry should turn out en masse in response to the great effort made by the Program Committee and the Exposition Committee. The dates are May 11 to 15, inclusive, and the place is Music Hall, Cincinnati, Ohio. The sponsoring organization is The American Mining Congress.

The Program Committee is made up of the following operators:

ILLINOIS-INDIANA DISTRICT

J. D. Zook, president and commissioner, Illinois Coal Operators Labor Association, Chicago; G. C. McFadden, assistant vice president, Peabody Coal Co., Chicago; T. C. Mullins, president, Sunlight Coal Co., Chicago; G. E. Lyman, general superintendent, Madison Coal Corporation, Glen Carbon, Ill.; H. H. Taylor, Jr., Franklin County Coal Co., Chicago; F. S. Pfahler, vice president and general manager, Superior Coal Co., Gillespie, Ill.; W. J. Jenkins, president, Consolidated Coal Co. of St. Louis, Mo.; W. F. Davis, president, St.

**S. Tescher****Paul Weir****E. D. Lucas****D. A. Stout****Edward Bottomley****Otto Herres**

PROGRAM COMMITTEE

EIGHTH ANNUAL COAL CONVENTION—THE AMERICAN MINING CONGRESS



F. W. Whiteside



Gomer Reese



I. N. Bayless

MEMBERS OF THE PROGRAM COMMITTEE

Louis & O'Fallon Coal Co., St. Louis; C. J. Sandoe, vice president, West Virginia Coal Co. of St. Louis, Mo.; Chas. Gottschalk, Big Vein Coal Co., Buckskin, Ind.; Hugh Shirkie, president, Shirkie Coal Co., Terre Haute; P. L. Donie, Linton Coal Co., Linton, Ind.; C. J. Fletcher, president, Old Knox Mining Co., Indianapolis; C. T. Hayden, general manager, O'Gara Coal Co., Chicago.

ANTHRACITE DISTRICT

T. D. Lewis, general superintendent, Lehigh Navigation Coal Co., Lansford, Pa.; R. E. Hobart, mechanical superintendent, Lehigh Navigation Coal Co., Lansford, Pa.; A. M. Fine, vice president, Hudson Coal Co., Scranton; Cadwallader Evans, Jr., general manager, Hudson Coal Co., Scranton; A. B. Jessup, vice president, Jeddo-Highland Coal Co., Jeddo, Pa.; Paul Sterling, mechanical engineer, Lehigh Valley Coal

Co., Wilkes-Barre; D. E. Ingersoll, chief engineer, The Pittston Co., Scranton; Jos. Mayers, general superintendent, Scranton Coal Co., Scranton; B. H. Stockett, general manager, Weston Dodson Company, Minersville, Pa.

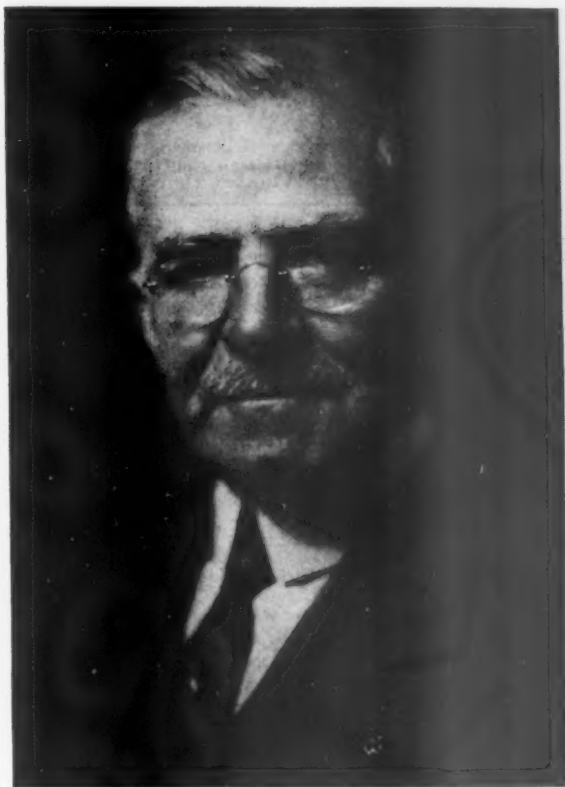
PENNSYLVANIA (BITUMINOUS)-NORTHERN
WEST VIRGINIA-OHIO DISTRICT

P. C. Thomas, vice president, Koppers Coal Co., Pittsburgh; Dr. L. E. Young, vice president, Pittsburgh Coal Co., Pittsburgh; R. M. Shepherd, president, Allegheny River Mining Co., Kittanning, Pa.; E. J. Newbaker, general manager, Berwind-White Coal Mining Co., Windber, Pa.; Albert L. Hunt, general superintendent, Pennsylvania Coal & Coke Corporation, Cresson, Pa.; T. R. Johns, general manager of coal mines, Bethlehem Mines Corporation, Johnstown, Pa.; A. J. Musser, vice president and general

manager, Clearfield Bituminous Coal Corporation, Indiana, Pa.; Newell G. Alford, Pittsburgh; C. W. Gibbs, general manager, Harwick Coal & Coke Co., Pittsburgh; D. D. Dodge, general superintendent, W. J. Rainey, Inc., Uniontown, Pa.; W. P. Vance, general superintendent, Butler Consolidated Coal Co., Butler, Pa.; J. J. Geary, general superintendent, Monessen Coal & Coke Co., Alicia, Pa.; A. R. Pollock, general manager, Ford Collieries Co., Curtisville, Pa.; Ezra Van Horn, general manager, Clarkson Coal Mining Co., Cleveland; Wm. P. Cayton, president, Rail & River Coal Co., Cleveland; A. B. Kelley, general manager, Humphreys Coal & Coke Co., Greensburg, Pa.; F. B. Dunbar, general superintendent, Mather Collieries, Mather, Pa.; M. D. Cooper, division general superintendent, Hillman Coal & Coke Co., Pittsburgh; R. V. Clay, assistant general manager, Wheel-



EIGHTH ANNUAL COAL CONVENTION—THE AMERICAN MINING CONGRESS



JAMES F. CALLBREATH
Secretary, The American Mining Congress



S. L. MATHER
President, The American Mining Congress

ing & Lake Erie Coal Co., Cleveland; H. L. Warner, general manager, Kanawha & Hocking Coal & Coke Co., Cleveland; E. J. Christy, construction engineer, The Wheeling Township Coal Mining Co., Adena, Ohio; Wm. Emery, Jr., president, The Cambridge Collieries Co., Cleveland; W. J. Heatherman, National Fuel Co., National, W. Va.

SOUTHERN WEST VA.-VIRGINIA-EASTERN KY.-TENN. DISTRICT

H. B. Husband, general manager of coal mining, Chesapeake & Ohio Railway Co., Dorothy, W. Va.; H. S. Gay, Jr., general superintendent, The Gay Coal and Coke Co., Mt. Gay, W. Va.; H. D. Smith, assistant to president, Ashland Coal & Coke Co., Bluefield, W. Va.; Chas. W. Connor, superintendent of mines, American Rolling Mill Co., Nellis, W. Va.; J. W. Bischoff, general superintendent, West Virginia Coal & Coke Co., Omar, W. Va.; J. D. Rogers, general manager, Stonega Coke and Coal Co., Big Stone Gap, Va.; Geo. T. Stevens, mining en-

gineer, Clinchfield Coal Corp., Dante, Va.; Thos. H. Clagett, chief engineer, Pocahontas Coal & Coke Co., Bluefield, W. Va.; C. A. Griffith, vice president in charge of operations, Pruden Coal Co., Pruden, Tenn.; L. C. Skeen, general superintendent, Fordson Coal Co., Stone, Ky.; L. B. Abbott, division engineer, Consolidation Coal Co., Jenkins, Ky.; T. E. Jenkins, vice president, West Kentucky Coal Co., Sturgis, Ky.

SOUTHERN DISTRICT

D. A. Thomas, president, Montevallo Coal Mining Co., Birmingham; C. E. Abbott, vice president, Tennessee Coal, Iron & Railroad Co., Birmingham; J. A. Long, general manager, Woodward Iron Co., Woodward, Ala.; C. P. Moore, general manager, Pratt Fuel Corp., Birmingham.

WEST CENTRAL DISTRICT

(Arkansas-Oklahoma-Kansas-Missouri-Iowa)

K. A. Spencer, treasurer and chief en-

gineer, Pittsburg & Midway Coal Mining Co., Pittsburg, Kans.; Ira Clemens, Commercial Fuel Co., Pittsburg, Kans.

FAR WEST DISTRICT

(Colorado-Utah-Montana-Wyoming-New Mexico-Washington)

D. A. Stout, chief engineer, Colorado Fuel & Iron Co., Pueblo, Colo.; F. W. Whiteside, mining engineer, Victor-American Fuel Co., Denver; S. Tescher, general superintendent, National Fuel Co., Denver; F. A. Sweet, president and general manager, Standard Coal Co., Salt Lake City; I. N. Bayless, Union Pacific Coal Co., Rock Springs, Wyo.; Edw. Bottomley, general superintendent, Sheridan-Wyoming Coal Co., Kleenburn, Wyo.; Gomer Reese, general superintendent, Kemmerer Coal Co., Kemmerer, Wyo.; E. P. Lucas, president, Bellingham Coal Mines, Bellingham, Wash.; Otto Herres, assistant manager, United States Fuel Co., Salt Lake City; Gilbert C. Davis, manager, Stag Canon Branch, Phelps Dodge Corp., Dawson, N. M.

PROGRAM

8th ANNUAL CONVENTION PRACTICAL COAL OPERATING MEN

The American Mining Congress

Cincinnati, Ohio
May 11-15, 1931

MONDAY, MAY 11—11 A. M.

MODERN COAL MINE MANAGEMENT

CHAIRMAN: HARRY N. TAYLOR
*Chairman of Board and General Manager,
United Electric Coal Companies*

(1) TRENDS TOWARD BETTER MANAGEMENT

*By P. C. THOMAS, Vice President, The Koppers
Coal Company.*

DISCUSSION:

T. R. JOHNS, *Bethlehem Mines Corp.*
R. L. IRELAND, JR., *Hanna Coal Co.*
PAUL WEIR, *Bell & Zoller Coal & Mining Co.*
W. D. BRENNAN, *Utah Fuel Co.*
EUGENE McAULIFFE, *Union Pacific Coal Co.*

(2) BUDGETING REPAIR WORK

*By B. H. MCCrackin, Maintenance Engineer,
Consolidation Coal Company.*

DISCUSSION.

MONDAY, MAY 11—2 P. M.

SAFE OPERATING PRACTICE

CHAIRMAN: F. M. SNYDER
President, C. C. B. Smokeless Coal Company

(1) MAINTAINING DISCIPLINE

*By THOMAS G. FEAR, General Manager of Operations,
Consolidation Coal Company.*

DISCUSSION:

R. V. CLAY, *Wheeling & Lake Erie Coal Co.*
JEROME C. WHITE, *Pittsburgh Coal Co.*
I. N. BAYLESS, *Union Pacific Coal Co.*
MILTON H. FINE, *DeBardeleben Coal Corp.*
A. R. POLLOCK, *Ford Collieries Co.*
EDGAR C. WICHTEL, *Hudson Coal Co.*

(2) SAFETY PROGRAM AT ARMCO—Records, Methods of Enforcement, etc.

*By CHARLES W. CONNOR, Superintendent of Mines,
The American Rolling Mill Co.*

GENERAL DISCUSSION.

TUESDAY, MAY 12—10 A. M.

MINING SYSTEMS

CHAIRMAN: ROBT. J. SMITH,
President, Princeton Mining Co.

(1) PENNSYLVANIA

*By M. D. COOPER, Division General Superintendent,
Hillman Coal and Coke Co.*

(2) ILLINOIS-INDIANA DISTRICT

*By I. D. MARSH, Superintendent, Alcoa Ore
Company.*

(3) MINE AND PREPARATION PLANT OF NO. 18 MINE OF TENN. COAL, IRON & RAILROAD CO.

*By ROBT. HAMILTON, Consulting Engineer, Tenn.
Coal, Iron & Railroad Co.*

(4) MINING SYSTEMS IN UTAH

*By GEO. A. SCHULTZ, General Superintendent,
Liberty Fuel Company.*

(5) STRIP MINING

*By GEO. E. NETTELS, General Superintendent,
Pittsburg and Midway Coal Mining Co.*

TUESDAY, MAY 12—2 P. M.

MECHANICAL MINING (Thick Seams)

CHAIRMAN: T. T. BREWSTER
*President and General Manager, Mt. Olive and
Staunton Coal Company*

(1) LOADING MACHINES

*By E. J. CHRISTY, Consulting Engineer, The
Wheeling Township Coal Mining Co.*

DISCUSSION:

H. A. THREAWELL, *Chicago, Wilmington & Franklin
Coal Co.*

(2) GATHERING SYSTEM WITH MECHANICAL MINING

*By C. J. SANDOE, Vice President, West Virginia
Coal Co. of Missouri.*

DISCUSSION:

DAVID INGLE, SR., *Ingle Coal Company.*

(3) MECHANIZED MINING AT CARBON FUEL COMPANY

*By C. A. CABELL, President, Carbon Fuel Com-
pany*

(4) MECHANICAL LOADING AT THE LITTLE BETTY MINING CORPORATION

*By P. L. DONIE, Vice President, Little Betty
Mining Corporation*

WEDNESDAY, MAY 13—10 A. M.

ANTHRACITE

CHAIRMAN: E. H. SUENDER,
Vice President, Madeira, Hill and Company

(1) ANTHRACITE RESEARCH FOR UTILIZATION

*By C. A. CONNELL, Acting Executive Director,
Anthracite Institute.*

(2) RESULTS OF PRESENT ANTHRACITE ROLL PRACTICE

*By PAUL STERLING, Mechanical Engineer, Le-
high Valley Coal Company.*

DISCUSSION:

R. E. HOBART, *Lehigh Navigation Coal Company.*

(3) PREPARATION OF ANTHRACITE FINES

*By E. P. HUMPHREY, Preparation Supervisor,
Lehigh Navigation Coal Company.*

(4) SPEEDING UP ROCK WORK IN ANTHRACITE MINES

*By RUSSELL L. SUENDER, Hill & Suender, Con-
tracting Engineers.*

DISCUSSION:

B. H. STOCKETT, *Weston Dodson & Co., Inc.*

(5) NOTES ON MECHANICAL MINING IN ANTHRACITE

*By JOHN C. HADDOCK, President, Haddock Min-
ing Company.*

WEDNESDAY, MAY 13—2 P. M.

SAFE OPERATING PRACTICE

CHAIRMAN: C. M. LINGLE

Vice President, Buckeye Coal Company

- (1) **COST OF MINE ACCIDENTS**
By R. M. LAMBIE, Chief, Department of Mines of West Virginia.
- (2) **SAFETY AND MECHANICAL MINING**
By W. J. JENKINS, President, Consolidated Coal Co. of St. Louis.
- (3) **SAFETY AT THE FACE**
By F. B. DUNBAR, General Superintendent, Mather Collieries.
- (4) **SAFETY WITH CONVEYORS**
By ALBERT L. HUNT, General Superintendent, Pennsylvania Coal & Coke Corp.
- (5) **SAFETY WITH ELECTRICAL EQUIPMENT**
By W. P. VANCE, General Superintendent, Butler Consolidated Coal Company.

THURSDAY, MAY 14—10 A. M.

MECHANICAL MINING (Thin Seams)

CHAIRMAN: H. L. WARNER

General Manager, Kanawha & Hocking Coal & Coke Company.

- (1) **CONVEYOR AND SCRAPER MINING IN THIN SEAMS**
By T. F. MCCARTHY, Assistant General Superintendent, Clearfield Bituminous Coal Corporation.
- DISCUSSION:
E. H. JENKS, Rochester & Pittsburgh Coal Co.
- (2) **LONG FACE CONVEYOR MINING AT THE STONEGA COKE AND COAL COMPANY**
By J. D. ROGERS, General Manager, Stonega Coke and Coal Company.
- (3) **CONVEYORS IN THIN SEAM MINING**
By L. H. SCHNEER, Division Manager, Consolidation Coal Company
- (4) **SUCCESSFUL HANDLING OF REFUSE**
By F. S. FOLLANSBEE, Chief Engineer, The Koppers Coal Company

DISCUSSION:

THURSDAY, MAY 14—2 P. M.

RECENT DEVELOPMENTS IN MINING PRACTICE

CHAIRMAN: C. F. RICHARDSON,
President, West Kentucky Coal Company

- (1) **MAIN LINE AND GATHERING**
By NEWELL G. ALFORD, of Eavenson, Alford & Hicks.
- DISCUSSION:
*R. L. KINGSLAND, Consolidation Coal Company.
R. G. STEVENS, Loup Creek Colliery Company.*
- (2) **CUTTING, DRILLING AND BLASTING**
(Changes in Cutting Machines, etc.)
By G. C. MCFADDEN, Assistant Vice President, Peabody Coal Company.

(3) TREATING MACHINE BITS

By H. H. TAYLOR, JR., Franklin County Coal Company.

(4) CONVEYOR SLOPE OPERATION AT INGLE MINE

By DAVIL INGLE, SR., President, Ingle Coal Company.

(5) ECONOMY OF CREOSOTED TIES IN COAL MINES

By D. D. DODGE, General Superintendent, W. J. Rainey, Inc.

FRIDAY, MAY 15—10 A. M.

RECENT DEVELOPMENTS IN COAL CLEANING

CHAIRMAN: ERSKINE RAMSAY

Chairman of the Board, Alabama By-Products Corporation

- (1) **AERSAND PLANT OF ALLEGHENY RIVER MINING COMPANY**
By R. M. SHEPHERD, President, Allegheny River Mining Company.
- (2) **WASHING PRACTICE AT THE NELLIS MINES**
By E. H. SHRIVER, Superintendent in Charge of Special Construction, The Koppers Coal Company.
- (3) **NEW WASHING PLANT OF BIG VEIN COAL COMPANY**
By CHAS. GOTTSCHALK, Vice President, Big Vein Coal Company
- (4) **COAL CLEANING AT PITTSBURGH TERMINAL COAL CORPORATION**
By JOSEPH PURSGLOVE, JR., Pittsburgh Terminal Coal Corporation.

FRIDAY, MAY 15—2 P. M.

FUEL UTILIZATION

[This session under auspices Committee of Ten.]

CHAIRMAN: E. B. LANGENBERG

*Vice Chairman of the Committee of Ten—
Coal and Heating Industries*

- (1) **PRACTICAL RESEARCH IN COAL BURNING**
By HOMER R. LINN, Committee of Ten, representing Institute of Boiler and Radiator Manufacturers
- (2) **AUTOMATIC REGULATORS AS THE COAL MAN'S ALLY**
By BEN L. BOALT, Committee of Ten, representing Heating Accessories Industry
- (3) **THE STOKER AND ITS PLACE IN THE FUTURE OF THE COAL INDUSTRY**
By LORIN W. SMITH, JR., Secretary of The Committee of Ten
- (4) **PROGRESS IN DEALER EDUCATION AND CONSUMER SERVICE**
By CARLYLE M. TERRY, Committee of Ten, representing The Anthracite Institute
- (5) **THE RETAIL DEALER'S ACTIVITIES AND NEEDS IN FURTHERING COAL UTILIZATION**
By MILTON E. ROBINSON, JR., President, National Retail Coal Merchants' Association

The



F. J. MAPLE
*Chairman of the Board of
Governors, The Manufacturers
Division, The American Mining
Congress*

EXPOSITION

COMPRISING nearly half a million pounds of equipment, ranging from mammoth mine cars and other heavy types of coal cutting and loading machinery, to small types of mining equipment and supplies, the coal exposition will represent all of the latest and modern developments in equipment for the safe, efficient and economical production of coal, displayed by more than 100 manufacturers who cater to the needs of the coal-mining industry.

More than 100 American manufacturers will have exhibits. There will also be an exhibit by a firm from Glasgow, Scotland. The Bureau of Mines of the Federal Government will also have an exhibit.

Some of the exhibits will be actual types of equipment, while others will be in miniature working models, and many of them will be in practical operation. Popular features in the exposition will be a guessing contest, with prizes, as to number of articles in glass jars, a mechanical entertaining robot, and motion pictures. Samples of every conceivable type of equipment for use in coal-mining operations will be on display at the exposition. The exhibit of the Bureau of Mines will feature the proper timbering of coal mines.

As in prior expositions, coal cutting, conveying, loading and transportation equipment will feature the heavier type of equipment on display. One of the pit-car loaders will have an hydraulic lifting device, with sealed ball bearings and requiring no further lubrication until it is necessary to rebuild and overhaul the machine. An 8-ton coal-cutting machine for use in low veins, a 3-ton shaker conveyor, and a duckbill for making the shaking conveyor self-loading, equipped with feeder, will be another

feature. A modern coal-washing system, with animated motion pictures showing its operation, will also be shown.

An interesting automatic weighing and indicating device, which prints the weight of each load passing over the scale, will be on view. A working model of a coal breaker and cleaner driven by motor, demonstrating the combined function of crushing, cleaning and sizing bituminous coal at the mine will be shown.

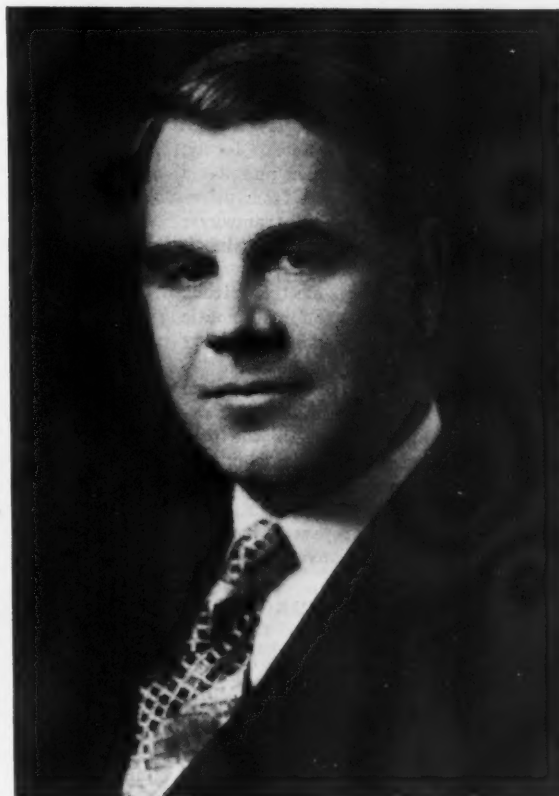
The operation in miniature of a four-track coal tippie, with belt conveyor, screens, loading equipment and refuse conveyor will be demonstrated. Another operating model will show a rotary dump and chain-haul car feeder in connection with track and miniature tippie, operated by push buttons by visitors.

A new invention in modern coal-cutting methods will be shown by a coal saw and coal hustler. The saw is a light, portable machine for sawing coal into blocks in the mine face, the blocks of coal being dislodged by hydraulic pressure pads in the sawed slots. It is said the use of this saw will eliminate the need for undercutting machines, coal drills and explosives and permit the production of coal in controlled measures. The machine has a capacity of from 40 to 50 tons a day. The coal hustler is designed to dislodge and load the coal and has a capacity of from 100 to 150 tons per eight-hour shift. It moves under its own power over mine tracks and has a horizontal grab bucket to

gather the coal, convey and discharge it into the mine car.

The air sand process for dry cleaning bituminous and the hydrotator wet washing process for cleaning and anthracite and bituminous will be shown. A mine car loader capable of loading from 40 to 60 tons of coal a day will also be on view.

The exposition will also show for the first time a one-man permissible type of electric coal drill and new fiber pipe. Mine jacks of from 1 to 100 tons capacity, large capacity rotary dump cars, gravity coal-cleaning tables, protective clothing and equipment for miners, ventilating devices, models of coal breakers, wrought and copper steel mine cars, an automat loading machine, a working model of a coal shovel, portable electric mine pumps in operation, underground conveyor equipment, and mine tipples and coal-cleaning plants in operation will



L. W. SHUGG

Director of Exhibits

(Courtesy of the General Electric Company)

EIGHTH ANNUAL COAL EXPOSITION—THE AMERICAN MINING CONGRESS

comprise interesting features of the exposition.

Other interesting exhibits will include a model of a pneumatic coal separator and dust collecting system in operation in cleaning coal; shovels, draglines, and cranes in open-cut mines; internally lubricated coal-mine hoisting rope; coal-cutting machines, electric shaker conveyor, belt conveyor, switch gears, and hose coupling; pipe joints and fittings; ball bearings; cables; explosives and blasting supplies; mine-car wheels; wire rope; iron and steel products; centrifugal pumps in operation at different levels; self-oiling, deep-well plunger pump and turbine; carving set forged from pieces of yellow strand cable; aerial tramways; electric and pneumatic coal drills; lubricants; coal-treating solutions; pressure rock-dust distributor; electric track switch thrower; equipment for automatic signaling installations; miner's safety lamps, etc., etc.

L. W. Shugg, of the General Electric Company of Schenectady, director of exhibits, has spent much time in the preliminary arrangements for the exposition, and predicts an outstanding display of mining machinery, equipment, and supplies especially prepared by the manufacturers for the convention.

THE AHLBERG BEARING COMPANY will show a complete range of the various types and sizes of ball bearings used in mining equipment. The exhibit will be in charge of Mr. F. O. Burkholder.

ALLIS-CHALMERS MANUFACTURING COMPANY exhibit will include vibrating screens, among other products of their manufacture.

THE AMERICAN CABLE COMPANY exhibit will consist of sample boards of cable used in the mining industry and also a special pictured exhibit of bridge work in which American Cable Company's cables are used. Mr. A. R. Whitcomb will be in charge.

AMERICAN CAR AND FOUNDRY COMPANY will exhibit a number of mine cars, in addition to mine car wheels, special drawbar and back bone pressed section, in use in rebuilding old cars; also new cars and cars which have been in continuous service for one or two years. One of the cars which has been in service is to be an electrically welded car. They will also display an automatic drop bottom car and two greater capacity cars. Mr. R. J. Smith will be in charge of this exhibit.

AMERICAN CAST IRON PIPE COMPANY will exhibit various kinds of pipe joints and fittings used for drainage purposes by the coal mining industry. J. K. Travis will be in charge.

THE AMERICAN COAL CLEANING CORPORATION exhibit will consist of a complete model unit of their American Pneumatic coal separator,

Some New and Interesting Exhibits

- A full-size aerial tramway bucket of the automatic tripping and dumping type.
- A new portable conveyor, the open side of which rises less than 5 inches from the mine floor, and which has an interchangeable backboard.
- Equipment for dust-proofing coal.
- An unique four-axle mine car.
- A mine car fitted with spring draft gear, double center bumpers and flexible rubber cushions.
- A new low-type arcwall cutting machine.
- Removable split rim gears.
- A coal saw—an innovation in the art of coal mining.
- The coal "hustler," a general purpose loader.
- New pit car loaders of every description.
- New shaker conveyor drives and troughs.
- New type automatic bottom-dumping mine cars.
- The latest low-vein room and pillar mining machines.
- A roller bearing mine car wheel being driven under load, using a silk thread as the driving belt.
- A vibrating screen with power unit mounted above screen sash.
- A new four-speed gear unit built in combination with a standard motor.
- A new "gas proof" mine locomotive headlight.
- An automatic recorder which shows on a moving chart the time that a trip passes a given location or whenever an operation takes place.
- A blasting cap guessing contest. Prizes will be awarded those guessing nearest the number of caps in a large glass receptacle.

with 100 percent dust collecting system, in actual operation, cleaning coal. The exhibit will be in charge of Edward O'Toole, Jr.

THE AMERICAN HARD RUBBER COMPANY will exhibit rubber lined steel pipe and fittings; rubber lined gate valves in various sizes, and hard rubber lined flumes, all representative of their work to protect equipment from corrosion by acid mine water. Photographs will amplify the exhibit.

THE AMERICAN MINE DOOR COMPANY will show a high-pressure rock dust "Distributor" carrying the approval of the Bureau of Mines for use in gaseous mines, an electric track switch thrower in operation mounted on switch points, and equipment used in connection with automatic signal installations. Chas. Vignos 2nd will be in charge of the exhibit.

THE AMERICAN STEEL & WIRE COMPANY will exhibit American Rail Bonds for mining and railroads, American wire rope for all purposes, rubber clad and mining machine cables. Messrs. C. J. Boon, A. C. Jones, H. H. Febrey, H. R. Barthel, and G. J. Schile will be in attendance.

The ALBERT & J. M. ANDERSON MANUFACTURING COMPANY exhibit will consist of plugs and receptacles, including those for permissible mine equipment; line material; automatic time switches; air vane relays for mine ventilation control; heavy knife switches. Barry G. Durham will be in charge of the exhibit.

The ATLAS POWDER COMPANY exhibit will consist of literature descriptive of their products.

The BALDWIN LOCOMOTIVE WORKS will show their equipment in conjunction with Westinghouse Electric & Mfg. Company.

The BETHLEHEM STEEL COMPANY exhibit will consist of an extensive display of trackwork and mine ties, switch stands, and a number of specialties. The exhibit will be supplemented by photographs.

The BONNEY-FLOYD COMPANY will exhibit three high-capacity mine cars, and also the Bonney-Floyd differentially heat-treated MM alloy steel mine car wheels, showing their construction and the application of Timken roller bearings in their construction. In addition to the above, there will be a display of Bonney-Floyd "HardKote," an economical and successful welding rod. The booth will be under the personal supervision of James L. Cawthon, Jr.

BRODERICK & BASCOM ROPE COMPANY.—A revolving wire rope exhibit approximately 4 feet in diameter, by 9 feet high; also a full-size bucket of the automatic tripping and dumping type used on their waste disposal aerial tramways. In addition to the above, they will exhibit a carving set forged from actual pieces of Yellow Strand cable, a friction grip used on their continuous multiple bucket aerial tramways, a full line of wire rope samples, and photographs of tramway installations. Booth space will be inclosed by ornamental fence made out of wire rope. F. W. Grice will be in charge.

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THE BROWN-FAYRO COMPANY exhibit will consist of the following: The "Brownie" Hoist, Model HG, complete with a Crocker-Wheeler type GFB motor and Trumbull switch. The "Brownie" Hoist, model H1b, featuring a mechanical brake for operations where remote control is required, or where it is desirable to hold the load on a grade for any length of time. A permissible mine car loader, Model LF-7½. The Austin-Brownie "Perfect Oiler" mine gathering pump. The "Brownie" Tubing Blower, Model BA, equipped with a General Electric type BD-226 motor. Timken Track Roller, 6" diameter by 18" face length, complete with supporting brackets. Mine car wheels, axles, etc. Timken wheel, featuring a special hub cap for hub caging. F. M. Davis will be in charge.

The BUCYRUS-ERIE COMPANY exhibit will consist of transparent photographs of shovels, draglines and cranes. The case holding these photographs will be effectively lighted. The photographs have been prepared by a special process which is exceptionally successful in retaining depth. M. J. Woodhull will be in charge of the exhibit.

CARNEGIE STEEL COMPANY will exhibit Carnegie copper steel mine ties, light rails, and Carnegie wrought steel mine car and locomotive wheels. R. L. Twitchell will be in charge of this exhibit.

The CENTRAL FROG & SWITCH COMPANY are manufacturers of frogs, bumper car stops, steel ties, portable turnouts, switch stands, guard rails, etc., and will present an interesting display of this equipment. The exhibit will probably be in charge of E. R. Heitzman.

CENTRAL MINE EQUIPMENT COMPANY will exhibit a Fairfield mine car loader, a short unit of sectional type conveyor equipment, and a new portable conveyor. The openside on this new conveyor is only 4 13/16" from the mine floor bottom to the top and the opposite side is furnished with an interchangeable back board which is removable and can be used on either side, thereby permitting the unit to be used on either side of the entry or in opposite faces. Coalmaster drill bits and the "Landahl" back stop will also be shown. The exhibit will be in charge of R. M. Patrick, Sales Manager.

CHICAGO PNEUMATIC TOOL COMPANY exhibit will be comprised of the following: Electric and pneumatic coal drills for all types of coal and the softer mine rock drilling; permissible flame-proof portable electric coal drill; permissible flame-proof mounted electric coal drill; electric and pneumatic maintenance and repair tools of the portable type; pneumatic rock drills. L. J. Walker will be in charge of the exhibit.

THE CINCINNATI MINE MACHINERY COMPANY will exhibit Cincinnati cutter chains and Cincinnati cutterheads. This exhibit will be in charge of E. P. Stenger.



Chas. C. Whaley
First Vice Chairman



Ralph C. Becker
Second Vice Chairman



J. T. Ryan
Third Vice Chairman

OFFICERS OF THE MANUFACTURERS DIVISION

COAL MINING will display copies of their magazine carrying the same name. P. F. Jasik will be in charge of this exhibit.

THE COAL TREATING EQUIPMENT CO. will exhibit equipment for the purpose of dustproofing coal. This company have specialized in equipment for mines, docks and coke ovens for the past three years. An engineering department is maintained to assure proper and efficient treatment of all sizes of coal and coke. A new solution for dustproofing coal has been developed through the assistance of this company and can be seen at the convention this year. There are many outstanding advantages in this new solution in making coal dustless. A. E. Shaw will be in charge.

THE COLONIAL SUPPLY COMPANY exhibit will consist of the new Colonial One-Man Permissible Type Electric Coal Drill, which has a 250-volt, direct-current motor; the Colonial One-Man 220-volt a.-c., 440-volt a.-c.; totally inclosed motor drills; and a display of their new Bermico fibre pipe. This display will consist of two arches made from Bermico pipe. This will be the first time any of these products have been exhibited. J. C. Mock will be in charge of the exhibit.

CONVEYOR SALES COMPANY, INC., will have on display booklets and descriptive literature concerning their equipment. In addition they will have parts and supplemental equipment on exhibition in full working size. R. A. Walter will be in charge of this exhibit.

A. D. COOK, INC., will exhibit a small, self-oiling, deep-well plunger pump and a small, self-oiling deep well turbine, both pumping water. They will also show deep-well cylinders, strainers, pump rods, etc. Cornelius O'Brien will be in charge of the exhibit.

The DEISTER CONCENTRATOR COMPANY.—This exhibit will consist of a No. 14 Deister-Overstrom diagonal-deck coal table with Concenco drive, a

No. 7 standard rubber-covered coal deck and a 4' x 9' double surface, double vibrator, motor driven Leahy NO-Blind vibrating screen. The exhibit will be in charge of C. W. Fugate.

THE DIFFERENTIAL STEEL CAR COMPANY exhibit will consist of an operating new type of mine car, full size and operating with a dumping device. There will also be photographs and drawings showing waste disposal equipment of the larry car type. H. F. Flowers will be in charge of the exhibit.

THE DUFF-NORTON MANUFACTURING COMPANY will exhibit their complete line of Lifting Jacks, and will include a complete line of mining machine jacks, and a number of other special tools designed particularly for use in the coal mining fields. The jacks range in capacities from 1-ton to 100-tons. Wm. G. Robb will be in charge of the exhibit.

DUNCAN FOUNDRY AND MACHINE WORKS, INC.—This exhibit will consist of their latest type conveyor and several pairs of mine car wheels showing the construction of same. F. E. Rhine will be in charge of the exhibit.

E. I. DU PONT DE NEMOURS & COMPANY, INC., will display a series of panels describing the principal explosives adapted to various conditions encountered in coal mining. There will also be on display some of the recent blasting accessories, and "Ventube" for installation where mine ventilation requires material of the Ventube character. Representatives of the Explosives Department of this company will be in attendance to supply information relating to the selection and use of explosives for coal mining.

EAGLE IRON WORKS will exhibit a working model of their new Type OC-7 Olson Self-Dumping Cages, with automatic car stop and release and the latest type improved cage. Literature on steel and wood cars will also be available. The exhibit will be in charge of C. B. Laird.

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EDISON STORAGE BATTERY COMPANY will exhibit parts and make-up of the Edison Battery; cutaway cells showing the assembled parts in place; dummy cells; a tray of cells; mine safety lamps, and other appliances. *F. J. Foley*, Manager Locomotive Department, will be in charge.

THE ELECTRIC MINE DOOR COMPANY will have a complete electric mine door on display, together with all accessories pertaining to it, blueprints and photographs. *Paul R. Hay* will be in charge.

THE ELECTRIC RAILWAY EQUIPMENT COMPANY exhibit will consist of display boards and an erected exhibit displaying trolley materials for mines, and will include several new devices, as well as their standard line. *C. A. Ca-wood* will be in charge of the exhibit.

THE ELECTRIC RAILWAY IMPROVEMENT COMPANY will exhibit its usual complete line of Erico rail bonds and portable welding rheostats for bonding. In addition, there will be shown a new type of cross bond for copper arc weld application. This bond has been designated "Type CX-2" and features the shortest possible bond for cross bonding as well as complete protection against derailed cars and dragging equipment. The maximum projection of bond terminal from the edge of the rail base is only $\frac{1}{4}$ in. *L. F. Heckert* will be in charge of the exhibit.

THE ELECTRIC STORAGE BATTERY COMPANY.—This exhibit will consist of sectional cells of Exide Batteries as used in propelling mine locomotives. *W. Fischelis* will be in charge of the exhibit.

ENTERPRISE WHEEL & CAR CORPORATION will show a full-sized mine car. Low type, extra large capacity, embodying a unique four-axle principle which allows the bottom to be free of obstructions, making it the ideal car for cross-over or kick-back dumps. Also long-lived, easy running trucks and other mine car specialties. *C. P. Daniel* will be in charge of the exhibit.

FAIRBANKS, MORSE & COMPANY will show a mine car dial scale, a motor-driven mine gathering pump, a motor-driven vertical deep-well turbine pump in operation, a sectionalized deep-well turbine pump, a ball-bearing motor-driven heavy duty centrifugal pump with cover raised to show interior of pump, a ball-bearing motor-driven side suction pump, and suitable oil paintings for the background. *G. J. Podelsak* will be in charge.

FAIRMONT MINING MACHINERY COMPANY will exhibit a Fairmont "Bronco" vibrating screen connected up and running; Model "A" Fairmont portable electric mine pump set up and running, and new underground conveyor equipment, including a face conveyor set up and running, and various parts of a main room conveyor not running. The rest of the exhibit will consist of framed photographs of tipples, Peale-Davis cleaning plants, and other equipment designed and built by Fairmont. *L. Sargeant* and *M. L. O'Neale* will be in charge of the exhibit.

FLOOD CITY BRASS & ELECTRIC COMPANY. This exhibit will consist of two boards one equipped with samples of line material and one equipped with miscellaneous items of bearing brasses. They will show samples of sectional insulator, ball bearings, rail bonds and wire rope. *C. N. Replogle* and *H. B. Hughes* will be in charge.

THE GENERAL CABLE COMPANY'S exhibit will comprise a display of Rome cords and cables including high-voltage shovel cables. There will also be special locomotive cables and standard cable accessories and jointing materials.

THE GENERAL ELECTRIC COMPANY will exhibit mine electrical equipment and accessories of all kinds, including motors, generators, locomotive parts, line material, etc. The exhibit will be in charge of *C. T. McLoughlin*.

GENERAL STEEL CASTINGS CORPORATION will exhibit a "Commonwealth" cast steel mine car underframe, duplicates of which are now in service daily in the anthracite fields. Also photographs of cast steel trucks, underframes, and beds for mine, industrial and railroad locomotives and trucks. Here you will see how it is possible to embody steel cylinders as an integral part of a cast steel locomotive bed. *W. M. Sheehan* will be in charge of the exhibit.

THE GOODMAN MANUFACTURING COMPANY'S exhibit will consist of the following: Their latest design low vein mounted bottom cutting machine, Government approved type; overall height of this machine is but 30 in. A Type 172 (heavy duty) shaking conveyor drive, rugged construction; may be equipped with either 20, 25, or 30 horsepower motor. A duckbill (for making a shaking conveyor self loading). This will be equipped with a high type feeder head. Overall height of this machine 45 in. A low type feeder head, interchangeable with the high type. Overall height of machine 19 in. A Model 70 Chicago Automatic Conveyor Company's pit car loader, of which the Goodman Mfg. Co. is exclusive agent in the United States, Canada, and Mexico. *J. D. James* will be in charge of the exhibit.

R. H. HAMILL COMPANY, specialists in the construction of industrial dwellings, will display photographs of various projects which they have built in the past. *D. G. Hughes* will be in charge.

HAZARD WIRE ROPE COMPANY will display all the special ropes designed by Hazard for peculiar and severe types of service.

HENDRICK MANUFACTURING COMPANY will exhibit perforated screen plates for sizing and cleaning coal, milled slot bronze plates for use in coal washing plants and Miteco grating for flooring in coal tipples and cleaning plants. *B. G. Shotton* will be in charge of the exhibit assisted by *D. M. Blackburn*.

HERCULES POWDER COMPANY. An interesting attraction at the Hercules booth will be a guessing contest in which a large glass receptacle will be filled with dummy blasting caps. Prizes of \$25, \$15, and \$10 will be awarded those guessing nearest the number of blasting caps in the receptacle. Several new products will be shown at the exhibit. Hercogel C, a gelatin type permissible of a higher count than thus manufactured, will be shown. This explosive can be used in place of Hercogel and similar gelatin permissibles in almost all wet work. For the first time Hercules is able to announce a complete series of pellet powders—grades A, B, and C. C grade pellet powder is fastest and strongest; A is strong and fast, B is slower and not so powerful.

Rotating panels, displaying Hercules complete line of coal mining explosives and blasting supplies, will be found at the exhibit. *W. B. Lyon* will be in charge.

HOCKENSMITH WHEEL & MINE CAR CO. will exhibit a mine car of special design for large capacity and rotary dump use. The car will be fitted with spring draft gear, double center bumpers and with 1 in. flexible rubber cushions. The bottom of the car will be steel construction with double bulb angles through the center, forming the back-bone of the car. The wheel and axle construction is such so that it is only necessary to remove four bolts to dismount the running gear for the car, making this a simple construction as to repairs. The wheels will be fitted with Timken roller bearings, and the axles extend to the outer walls of the car. *W. D. Hockensmith* will be in charge of the exhibit.

HULBURT OIL & GREASE COMPANY will have on display several drums of the various densities of lubricating grease for use on coal mine equipment. They will also display various systems of lubrication. *E. W. Wanner* will be in charge of this exhibit.

HYDROTATOR COMPANY will consist of moving pictures showing animated drawings and installation pictures of the new air-sand process for dry cleaning of bituminous coal, and the Hydrotator wet washing process for cleaning anthracite and bituminous coal. The animated drawings show the principle upon which these processes work and give a much clearer idea of the principles involved than any other method of presentation. *E. B. Day* will be in charge.

IRWIN FOUNDRY & MINE CAR COMPANY will exhibit an all-steel mine car, one-fourth actual size. Also different styles of mine car wheels. The exhibit will be in charge of *Chester G. Sensenich*.

THE JEFFREY MANUFACTURING COMPANY will exhibit the following equipment: A new lowtype Arcwall cutting machine, known as the Jeffrey 29-L, for making a top, center or bottom cut and especially designed for working in low coal; Jeffrey A-6 post drill, for A. C. or D. C. current, with perfect feeding control and fast mechanical return;

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Jeffrey automatic transfer switch for all types and makes of gathering locomotives, for transferring automatically from trolley circuit to cable reel circuit; Jeffrey continuous steel strip resistance for locomotives, coal cutters, loading machines, etc., embodying an element of non-oxidizing high resistance steel wound in a continuous strip; Jeffrey controller for mine locomotives—designed for severe duty; Jeffrey removable split rim gears, designed to eliminate the old laborious method of removing worn out solid gears; Jeffrey blowers in standard and Government approved types for mine ventilation. The exhibit will be in charge of *Russell W. King*, of the Jeffrey Mining Engineering Department.

THE JONES FLEXIBLE CONVEYOR COMPANY will have on display their shaker type conveyor with rope drive, permitting several units to be driven from one engine. *John P. Whelan* will be in charge of the exhibit.

JOY BROTHERS exhibit will consist of two machines; a coal saw and a coal hustler. The coal saw is a new innovation in the art of coal mining. It is a light portable machine for the purpose of sawing the coal face up into blocks of predetermined sizes. After the blocks are formed they are dislodged from the face by means of hydraulic pressure pads inserted in the sawed slots. The machines weigh 1,000 pounds each and have a capacity of 40 to 50 tons per day.

The coal hustler design makes it well adapted as a general purpose loader, for loading coal that has been previously undercut and blasted. It weighs less than 2 tons, has an overall length of 10 ft., 4½ ft. in width and may be operated in seams of coal 3½ ft. or more in thickness. It is estimated to have a capacity of 100 to 150 tons per 8 hour shift. *J. F. Joy* will be in charge.

JOY MANUFACTURING COMPANY will exhibit their 5 BU permissible loader. *A. S. Knoizen*, assistant sales manager, will be in charge.

KANAWHA MANUFACTURING COMPANY'S exhibit will consist of mine cars and tippie equipment. *C. E. Parks* will be in charge.

KEYSTONE LUBRICATING COMPANY will display a complete line of Keystone lubricants for mining equipment. *George W. Hall* will be in charge.

The **KOPPERS-RHEOLAVEUR CORPORATION'S** exhibit this year will consist of a scene-in-action display measuring 4 ft. by 6½ ft., which is a reproduction of a sealed discharge Rheolaveur plant for cleaning coal up to 6 in. in diameter, and an enlarged colored drawing of a free discharge plant with a series of pictures enlarged and framed showing various installations. In addition to this, there will be a moving picture showing continuously views of various washing plants of this company now in operation. *John Griffin* will be in charge.

THE LABOUR COMPANY, INC., will exhibit self-priming centrifugal pumps in operation, working in connection with three automatic suction valves

MODELS WHICH WILL BE ON DISPLAY

A rotary dump and chain haul car feeder built on a scale of one inch to a foot, with track and a miniature tippie, with push button control arranged so that visitors can operate.

A miniature track model showing how mine signals are applied to facilitate the movements of trips and to protect them against collisions.

Miniature tipples complete in every detail and in actual operation.

Working models of coal breakers and cleaning plants.

A model of a pneumo-gravity coal cleaning table.

A complete model unit of a pneumatic coal separator in actual operation.

Working models of self-dumping cages with automatic car stop and release.

located at different levels. The exhibit will clearly show the ability of the pump to handle air and prime itself and will also demonstrate the way in which the valves operate. The exhibit will be in charge of *N. A. Pedersen*.

A. LESCHEN & SONS ROPE COMPANY will have samples of the different types of wire rope for the various conditions encountered in mining work; also aerial wire rope tramway buckets which will demonstrate the operation of the special features on this type of equipment. A two-reel moving picture film will show scenes in the plant where the products are made, as well as scenes in the field where these products are in operation. *W. C. Richards* will be in charge of the exhibit.

LINCOLN ENGINEERING COMPANY will exhibit a central lubricating system which is semi-automatic in operation for use on coal washers, coal screeners, breaker systems, mechanical loaders and mine locomotives. They will exhibit the EM-200 Electric Lubrigun for mine car lubrication. This machine has a tank capacity of 200 lbs. of grease and will discharge from 4 to 6 lbs. of grease per minute, depending upon the consistency of grease used, at a pressure of 1,200 lbs. per square inch. This machine is entirely automatic in operation. A smaller unit will be on display, known as the EM-25 Electric Lubrigun, which has a tank capacity of 25 lbs. of grease and will deliver approximately 1¼ lbs. of grease per minute at a pressure of 1,200 lbs. per square inch. This machine is designed for lubricating conveyors, mechanical loaders, mine locomotives, and tippie equipment. A complete line of their three styles of grease plugs in various thread sizes, will also be shown. The exhibit will be in charge of *Frank F. Barks, T. V. Pieraux, Foster Holmes* and *Chas. R. Hooten*.

The **LINK-BELT COMPANY** exhibit will feature the Link-Belt Simon-Carves coal washing system. In addition to this unit, there will be an animated motion picture showing how the Link-Belt Simon-Carves system works. A talking mechanical robot will entertain the at-

tendants. Photographs and literature will be available. *Messrs E. J. Burnell, James Drinkwater, J. W. Wilson, Geo. Jaxon, R. A. Mitchell*, and others will be in attendance.

THE LORAIN STEEL COMPANY will exhibit a sectional main conveyor, sectional face conveyor, composite mine car, Langham collapsible mine post jacks, and timber jacks. *G. J. Hahn* will be in charge of this exhibit.

MCGRAW-HILL CATALOG & DIRECTORY CO. will have on display in their booth *Coal Age*, coal mining catalogs, the Coal Mining Directory, Keystone Coal Buyer's Catalog and Directory.

MACWHYTE COMPANY will exhibit a large reel of 1½-in. diameter, internally lubricated coal mine hoisting rope. It is lubricated with a special corrosion-resisting compound which is put on in such a way as to leave very little lubricant on the outside of the rope. *N. T. Miles* will be in charge of this exhibit.

MAVOR & COULSON, LIMITED, will exhibit a M. & C. "Samson" coal cutter, equipped with an A. C. three-phase motor; standard longwall chain type machine for cutting at floor level with 6-ft. cutter bar; M. & C. "Low Seam Samson" coal cutter, equipped with direct-current motor; standard longwall chain type machine for cutting at floor level in thin seams, the total height being 12 in.; M. & C. "Samson" electric shaker conveyor driving gear with A. C. three-phase motor, built on modern coal cutter lines and being only 16 in. high; complete section of M. & C. troughed type belt conveyor with top and bottom idlers showing the patented construction of the structure, which also gives complete protection to the return belt throughout the length of a conveyor; complete drive unit and tension end with intermediate length of conveyor showing the M. & C. flat type belt conveyor for coal face work. The same principle of return belt protection as in the troughed belt conveyor is included. The design enables the conveyor to be speedily taken adrift, moved forward through props on the coal face, and rebuilt in the new run. Switch-gear exhibits, including 100-ampere, flame-proof, oil immersed switch, and automatic circuit breaker and a remote control gate-end box. A patented hose coupling for compressed air, steam petrol, oil, etc., known as the "Gullick" coupling. *G. M. Gullick* will be in charge of the exhibit.

The **MINE SAFETY APPLIANCES COMPANY** will feature a complete line of Edison Electric mine lamps, including approved cap lamps, portable searchlights, hand lamps and trip lamps, as well as fireproof charging racks—the latest developments in safe and efficient mine lighting. In addition to the Edison display, the Mine Safety Appliances Company will feature a complete line of first-aid materials, gas-detecting instruments and respiratory protective equipment, including the Burrell All-Service Gas Mask, the Improved M-S-A Self-Rescuer and McCaa Two-Hour Oxygen Breathing Apparatus. Other features

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include four distinct models of M-S-A Protective Hats, together with the latest developments in safety clothing, signs, goggles, etc. *John T. Ryan*, Vice President and General Manager, will be in charge of the exhibit.

THE MINING CONGRESS JOURNAL booth will have a map of heroic proportions showing the distribution of the JOURNAL throughout the coal regions of the United States. An electric book is to tell the outstanding facts about "The Spokesman of the Industry" and a voice of mysterious origin will occasionally speak up to inform those present about the functions of "The National Representative of Mining"—The American Mining Congress. Ample facilities are to be provided for the comfort of visitors. *Messrs. Cott, Moran, Dickinson and Hadley* will be in attendance.

MINING SAFETY DEVICE COMPANY exhibit will consist of rotary dump and chain haul car feeder built on scale of 1 in. to a ft. These machines will be shown in connection with track on miniature tippie and will be operated by push buttons. The push buttons will be arranged on conduit stand so that visitors to the booth can operate the machines themselves. The dumping operation will represent dumping cars coupled with swivel couplings and the chain haul feeder will be reversible so that after the trip has passed through the dump it may be pulled back by means of the chain haul without further attention than push button control.

Other models will be shown of the following: Nolan automatic double horn cagers, Nolan automatic single horn cagers, Nolan mine car retarders, Nolan automatic feeder to cross-over dump, Nolan automatic feeder to scales and dump. In addition the exhibit will be composed of framed photographs of various car control units. *G. W. Merritt* will be in charge of the exhibit.

The MORROW MANUFACTURING CO. will exhibit a miniature four-track tippie built on a scale of 1½ in.-12 in. The equipment consists of the following units: Belt conveyor for r. o. m. coal; 4 track, 4 grade shaker screens; 3 combination picking tables and loading booms; slack conveyor to mixing or re-assembling conveyor; reassembling conveyor; rescreen conveyor; refuse conveyor.

The tippie and all equipment is complete as to detail and all units will be in operation. *H. S. McClain* will be in charge of this exhibit.

MT. VERNON CAR MFG. CO. will exhibit a pit car loader that will embody several new features in design such as a hydraulic lifting device, sealed ball bearings that require no further lubrication until it is necessary to completely rebuild and overhaul the machine. They will also exhibit some pit car wheels and miscellaneous forgings of different kinds and of a wide variety. *R. K. Weber* will be in charge of the exhibit.

MYERS-WHALEY, INC., will have on display a No. 3 size Whaley automat, a working model No. 3 size Myers-

Whaley shovel, and photographs of machines in operation. *Charles C. Whaley* will be in charge of the exhibit.

THE NACHOD & UNITED STATES SIGNAL COMPANY, INC., will exhibit an operative miniature track model showing how mine signals are applied to facilitate the movement of trams and to protect them against head-on collisions, with full-size signal relays, light signals and trolley contactors on the side. The company will also display the Nachod Automatic Headway Recorder for recording on a moving chart the time that a tram passes a given location or whenever an operation takes place. There will also be shown the Cheatham switch, an electrically operated switch-point throwing device, so that the switch point may be thrown at will from the motor. Those in charge of the exhibit will be *Carl P. Nachod*, president; *R. E. Tafel*, engineer; *J. A. Miller*, engineer.

NATIONAL CARBON COMPANY, INC., will exhibit carbon graphite and metal graphite brushes, welding carbon products, and Gredag lubricants at their booth. Other units of Union Carbide & Carbon Corporation will exhibit: U. C. C. methane detector, 100-lb. drums Union carbide (miner's lamp size), carbide drum pyramids (miner's lamp size), 100-lb. drums carbic cakes, No. 14 carbic lamp, No. 2 carbic lamp, Linde "K" cylinders, P. O. L. "KW" cylinders, P. O. L. "WC" cylinders, P. O. L. "B" tanks (polished), P. O. L. 5-in. 1 outfit (mounted), osweld two-wheeled truck, osweld welding and cutting torches, regulators, gauges, etc., Everready single-shot firing units, Everready permissible flashlights. *Messrs. V. J. Nolan, H. C. Stelling, and F. M. Lamson* will be in charge of the exhibit.

THE NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY will show cast-steel steam-shovel chains, swivel hitchings, steel single-link hitchings, mine-car wheels, and mine-car couplers.

NATIONAL TUBE COMPANY, manufacturers of pipe and tubing. *W. L. Schaeffer* and *John M. Denney* will be in charge.

THE NIAGARA ROLLER BEARING SCREEN CO. will have on display a new, large capacity vibrating screen 4 ft. wide and 14 ft. long, designed particularly for the coal fields. This is designed to fit into the present coal tipples with a minimum amount of change to the structure of the tippie. *Albert E. Owen* will be in charge of the exhibit.

NORMA-HOFFMANN BEARINGS CORPORATION will exhibit a complete range of ball, roller and thrust bearings, including heavy duty ball and roller bearings designed with bronze retainers for mine service. They will also have on display drawings and blue prints illustrating change-over mountings for mine locomotive motors, together with typical mountings in other types of mining machinery. The exhibit will be in charge of *Mr. Kilham* and *A. A. Van Pelt*.

OHIO BRASS CO. The exhibit will consist of their regular products of overhead line materials, rail bonds, head-

lights, safety and control devices, and high-tension insulators. *Mr. J. C. Wilson* will be in charge of the exhibit.

THE PENNSYLVANIA CRUSHER COMPANY will exhibit a working model of the "Pennsylvania" Bradford coal breaker and cleaner. This motor-driven model demonstrates the combined functions of crushing, cleaning and sizing. The automatic separation and discharge of harder refuse, such as wood, sulphur balls, slate, bone, rock and tramp iron is particularly interesting and impressive. The exhibit will also include a small size single-roll crusher. This single-roll crusher is designed for the reduction of lump coal to nut or egg sizes. A spiked toothed roll is provided, which pierces the lumps of coal, which results in a minimum of slack in the product. The crusher may also be used for the reduction of R. O. M. coal to 1½-in. size and under for stoker and pulverizer feed. Also a large number of photographic illustrations, interesting samples of miscellaneous refuse and tramp iron removed by both Bradford breaker and Hammer-mill types, and samples of various kinds of coal, before and after preparation, will also be on exhibit. Their exhibit will be in charge of *John Alden Plimpton*.

PENNSYLVANIA LUBRICATING CO. will exhibit a full line of mine greases. *R. B. Bedford, Jr.*, will be in charge of the exhibit.

PENNSYLVANIA MINING MACHINERY CORPORATION will have on display a model of the Peale-Davis pneumo-gravity cleaning table, also photographs of existing cleaning plants, etc. *O. T. Scollon* will be in charge of this exhibit.

PHILLIPS MINE AND MILL SUPPLY CO. exhibit will consist of a composite steel mine car equipped with Phillips open-cap wheel truck and spring drawheads. The display is so arranged that all the special features of design may be inspected. The car is one which has been in actual service for 14 months. There are also photographs showing a number of other designs of mine cars, together with a display of various mine-car details. *J. Milton Duff* will be in charge of the exhibit.

THE PITTSBURG BOILER & MACHINE COMPANY will maintain a headquarters where they will have on display circulars, catalogues, and brochures of the equipment they manufacture. *Messrs. C. W. Waterman, C. H. J. Patterson, and H. W. Riley* plan to be present.

THE PITTSBURGH KNIFE & FORGE CO. will exhibit various types of mine-car couplings, drop-forged swivels, mining-machine bits, bit boxes, etc., as well as a display board showing the various types of drop-forged links used in their couplings. *E. J. Rigdom* will be in charge of this exhibit.

PORTABLE LAMP & EQUIPMENT CO., distributors for Koehler Manufacturing Company, of Marlboro, Mass., will show the latest improvements in Wheat electric miner's cap lamps and the Koeh-

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ler flame safety lamp. Sample units of lamps and racks will be on exhibit. *Geo. C. Nelms* will be in charge of the exhibit.

THE POST-GLOVER ELECTRIC CO. will exhibit P. G. steel resistance grids, P. G. starters, and P. G. automatic transfer switches, all products of their own factory. In addition, they will feature a line of Tule lubricants manufactured by the Universal Lubricating Company, of Cleveland, Ohio.

PRUYN COMPANY OF AMERICA. This exhibit will consist of ball bearings. *C. Van Ness Pruyn* will be in charge.

THE PURE OIL COMPANY exhibit will include various mine greases and industrial oils, and will be in charge of *C. L. Hensley*.

ROBERTS AND SCHAEFER COMPANY. This exhibit will consist of framed pictures, a large special portfolio of photographs and special framed drawing of a tandem hydro separator. The exhibit will be in charge of *Frank E. Mueller*.

JOHN A. ROEBLING'S SONS CO. will have on display samples of wire rope and insulated wires and cables. *Fred J. Maple* will be in charge of the exhibit.

ROBINSON VENTILATING CO. will exhibit a model of a reversible mine fan, showing the operation of this equipment as installed for primary mine ventilation; three blowers for auxiliary ventilation to be used with flexible tubing, steel pipe or sewer-pipe conduit, and a model of a forced-draft fan. A man-cooling fan, which can be used for cooling men working in power plants or in mills, factories, foundries, or other hot spots will be exhibited. This man-cooling fan is similar to a desk fan, except much larger, and can be either bolted to the floor and arranged for direction of air flow, or it can be raised or lowered on the stand, or it can be placed on the floor without bolting and moved from one place to another. *L. R. Robinson* will be in charge.

JOSEPH T. RYERSON & SON, INC., exhibit will consist of a board the full length of the exhibit space on which will be displayed various items of iron, steel and machinery adaptable to coal-mining fields. This will include samples of special and alloy steels, as well as cold-finished steel, bulletins, and literature. *Lewis E. Skinner* will be in charge of the exhibit.

SAFETY FIRST SUPPLY COMPANY exhibit will consist of the following: Miners hats and caps, goggles, helmets, first-aid supplies and kits, protective wearing apparel, bulletin boards. *Jas. M. Cobb* will be in charge of the exhibit.

SAFETY MINING COMPANY will exhibit the new 1½-in. and 2½-in. cartridges which are the present standard shells and which have been adopted by this company since the last convention. Both of these bear the approval of the Bureau of Mines as permissible blasting devices. *C. J. Rihacek*, sales manager, will be in charge.



SANFORD-DAY IRON WORKS, INC., will show models of mine cars and one model of a new type automatic bottom-dumping car for standard railroad service. Among the small models they will show for the first time a new type automatic bottom-dumping mine car; also moving pictures of mines where their equipment is in use. *Geo. E. Jones, Jr.,* will be in charge.

SIMPLEX WIRE & CABLE CO. exhibit will consist of the following: Various types of insulated electrical wires and cables, including Tirez mining machine and locomotive cable, Tirez high-voltage cables, Tirez portable cord, metallic and non-metallic distribution cables, shaft and borehole cables. *A. Hagen* will be in charge of the exhibit.

SIMPLICITY ENGINEERING CO. exhibit will consist of a 2 ft. x 3 ft. double-deck, V-belt, motor-drive utility screen. *George W. Behnke* will be in charge of exhibit.

STREETER-AMET COMPANY will exhibit a weight indicating and recording device which automatically prints the weight of each load passing over the scale platform. *H. F. Reck* will be in charge of the exhibit.

SULLIVAN MACHINERY COMPANY will exhibit one of its latest low-vein, direct-current, electric-room and pillar "CR-2" mining machines mounted on self-propelling truck and equipped with modern remote contactor control. The controlling apparatus remains on the truck when the machine is unloaded and while it is crossing the face. This machine stands only 15½ in. high while operating and is equipped with rope feed of the most recent design, having two live or power drums. They will also exhibit a modern, low-vein, mine-car air compressor, equipped with direct-connected, open-type, electric-motor drive for non-gassy mines.

Another feature will be two of the Sullivan double-drum, portable electric hoists for scraper-loading service. The two extremes in the Sullivan line will be illustrated, since one of these hoists will be a 7-hp. unit having a rope pull of

2,250 lbs. and the other a 75-hp. unit capable of exerting a pull of 8,250 lbs. The new Sullivan coal-mining machine-cutter chain, made of reinforced section chrome nickel steel will also be shown as well as new silico-manganese cutter bits. Stringalite safety mine lighting cable will also be featured.

The company will be represented at Cincinnati by *Howard T. Walsh*, vice president; *Charles B. Officer*, chief engineer; *H. C. Berkey*, in charge of coal-mine sales; and by *W. R. Jarvis*, Pittsburgh; *E. L. Thomas*, Knoxville; *G. P. Small*, Birmingham; *Don M. Sutor*, St. Louis; *B. B. Brewster*, manager Illinois-Indiana-Kentucky territory; and others.

TEMPLETON, KENLY & CO. will have the usual display of Simplex mining jack models, which are Nos. 84, 85, 185, 22, and the 325 Simplex timber jack. In addition, they will also show this year the new No. 327 Simplex post puller. *William Simpson* will be in charge of the exhibit.

THE TIMKEN ROLLER BEARING COMPANY exhibit will consist of a large illuminated sign of the symbol "Timken Bearing Equipped." They will show a specially mounted mine-car wheel driven by a small electric motor, demonstrating the thrust-carrying capacity of Timken bearings. To demonstrate this capacity a large steel-mill bearing, weighing several hundred pounds, will be placed on the wheel. The driving belt from the wheel to the motor will be a silk thread. They will also show an assortment of Timken bearings such as are used in the mining industry. Exhibit will be in charge of *E. C. Reither*.

THE TOOL STEEL GEAR & PINION COMPANY will exhibit gears and pinions which are used on mining machines, mechanical loaders, and electric locomotives, all of these gears and pinions being subject to most severe operating conditions. In addition, they will exhibit sets of gears and pinions showing the uniformity and depth of hardness for which "Tool Steel" product is noted. *R. L. Reichling* will be in charge of the exhibit.

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BERTRAND P. TRACY COMPANY will show a model of their underground conveyor, an improved type cutter bar, the Cincinnati cutter chain, repair parts for machines and locomotives, welding wire products, carbon brushes, Strom ball bearings. *J. L. Goss* will be in charge of their exhibit.

THE TRAYLOR VIBRATOR COMPANY will display a 48 in. x 84 in. single-deck Trayco Conveyanscreen, which will have a weight of approximately 3,000 lbs. and also a small feeder conveyor. *Paul Wigton*, vice president, will be in charge of the exhibit.

TRUSCON STEEL COMPANY will exhibit a sample arch composed of Truscon steel tunnel liner plates for the lining of mine tunnels. They will also exhibit extension rails, which are very useful for extending the working rail to the face of the cut, avoiding the necessity of laying temporary short rails. Exhibit will be in charge of *G. Kahn*.

THE W. S. TYLER COMPANY will exhibit their latest type vibrators screens, testing sieve shaker, and numerous samples of woven wire screen cloth. The exhibit will be in charge of *G. R. Delameter*.

TYSON ROLLER BEARING COMPANY will display a full line of roller bearings. *W. P. Pritchard* will be in charge.

THE UNITED STATES BUREAU OF MINES exhibit will feature the proper timbering of a coal-mine roof, using full-size timber. The set-up will show the timbering of a roof cave in an entry and another the proper timbering of a face. Diagrams, pictures, publications, etc., will also be available in the booth. *Albert A. Munsch* will be in charge of the exhibit.

THE UNIVERSAL LUBRICATING COMPANY will present their line of "Tulc Mining Lubricants." Various grades will be in their space, so that inspection can be made. Some photostatic copies of results will be on exhibit. The exhibit will be in charge of *Geo. F. Lytle, T. H. J. Williams* and *J. C. Daigen*. The Post-Glover Electric Company, of Cincinnati, Ohio, are exclusive distributors for "Tulc" in the coal-mining fields.

THE VULCAN IRON WORKS COMPANY (Denver) will exhibit the following material: Vulcan-Denver No. SCB-15 shaker conveyor driving unit, Star through fastener, Vulcan-Timken rope idlers, Flottmann double-acting shaker conveyor air drive, Flottmann pneumatic coal picks and sectional model of same. *R. H. Fox* will be in charge.

THE WATT CAR AND WHEEL COMPANY will exhibit models of dump cars, automatic switches, and locomotive bumpers. They will have a Watt rail bender and straightener machine in operation, showing how easy it is to bend or straighten 40-lb. rails. The exhibit will be in charge of *R. L. Edgar*.

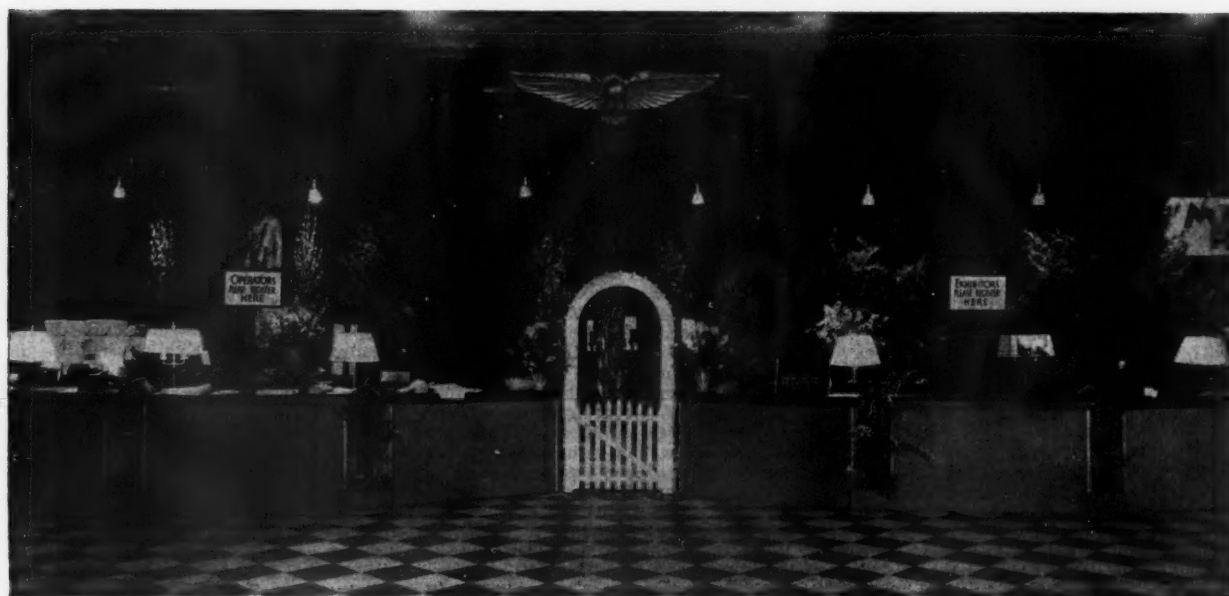
WEIR KILBY CORPORATION will show photographs of their plant and material in process in the plant. They will have on display several items of mine track work, such as Weir Titan frog, design 25 parallel switch throw with spring connecting rod, design 9 guard-rail clamp, etc. The exhibit will be in charge of *W. F. Robinson*.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY'S exhibit will include the type XO automatic transfer switch, as used with mine locomotives, and the type M resistor for mine locomotive service. A new cable guide for gathering reels and a fan-cooled squirrel cage motor for use in explosive

atmospheres will be shown for the first time. Surrounding a standard SK d. c. motor will be transparent photographs illustrating various applications. There will also be a complete display of the entire Westinghouse line of line material.

Delegates will have an opportunity to see the new Westinghouse-Wise multi-speed drive, the new four-speed gear unit built in combination with a standard motor, forming a completely self-contained and compact unit. The Westinghouse-Nuttall type DH7 double reduction speed reducer, and a new mine locomotive trolley will also be on display. There will be a new and novel brush display mounted on an endless belt. A new explosion tested control box for 26-in. locomotives and a new "gas proof" mine locomotive headlight will also be shown. The latter is claimed to be the most outstanding and recent development in locomotive headlights on the market today. *P. H. Grunnagle* will be in charge of the exhibit.

THE WEST VIRGINIA RAIL COMPANY will have on display a complete line of switch stands, including the smallest ground throw switch stand that is made up to and including the large type parallel throw switch stand for main line railroad traffic. A full line of steel mine ties from the small light tie used for room work up to and including heavy main line haulage ties. A display section board showing all of the special shapes, as well as rails and joints made by this company. A short section of the lightest standard ASCE type of rail that is rolled, in comparison to and displayed with a short section of ASCE rail weighing 5,000 lbs. per yard. The striking contrast between an 8-lb. ASCE rail measuring 2 in. in width and height and a 5,000-lb. ASCE rail measuring 42 in. in width and height is very evident. This company will maintain expert track work consultation service at their booth. *J. B. Haskell* will be in charge of their exhibit.



Registration Desks at the 1930 convention



Leaders in Coal Industry present views on the IMPORTANCE of the CINCINNATI MEETING

J. B. Warriner,
President, Lehigh Navigation Coal Company.

"The necessity for such exchanges is becoming greater every year as the mining industry becomes more thoroughly mechanized and electrified."

IN recent years it has been accepted as a matter of course that our operating department should be represented at the Cincinnati meeting of the Mining Congress. As a general proposition, mining executives work in comparative isolation a large part of the time; at least the opportunities for exchange of ideas and information are usually more meagre than in most other industries.

The necessity for such exchanges is becoming greater every year as the mining industry becomes more thoroughly mechanized and electrified. The industry can not hope to find the answer to all its problems in its own experience, and particularly individual operations or individual executives can not hope to succeed merely on the strength of their own resourcefulness and ingenuity. This has been emphasized by the keen competition of recent years; competition from sources outside the industry to an even greater degree than between coal-mining units.

The Cincinnati meeting affords just the sort of contacts which practical mining

men need at regular intervals. The monthly journal has its own peculiar and useful place, but is not a substitute for an assemblage and intermingling of men from the widely separated coal fields, and from various other industries whose products and services have done so much in achieving the modernization of mining and preparation of coal, and whose efforts are being continued toward even greater improvement.

Paul Weir,
Vice President, Bell & Zoller Coal & Mining Company.

"No agency has done as much to stimulate interest in mechanized mining."

THE "Cincinnati Convention," as it is familiarly known from coast to coast and from Lakes to Gulf, has had a remarkable growth. Year after year the attendance increases and the exposition becomes larger and finer. There are reasons for its continued growth and success.

The papers which are presented at the meetings represent the best thoughts of the best brains in the industry. The subject matter covers the whole field of mining from exploration to the loading of the coal in railroad cars or barges. All

coal-producing fields in this country are considered. The papers are prepared so that any practical man can understand them. The benefits of the discussions can not be had except by attendance.

The exposition can be likened to an enormous department store which merchandises modern mining equipment. There is offered to the practical operating man no other such opportunity for shopping. The manufacturers of mining equipment can find no show window anywhere in front of which so many prospective buyers pass.

It is impossible for any progressive individual to attend the convention and exposition without obtaining thoughts and ideas which are invaluable to himself or his employer. He is able to make contacts and form friendships with men from the different mining districts. These contacts are thoroughly worth while when the necessity arises for investigation of new methods and new equipment.

No agency or group of agencies has done as much to stimulate interest in mechanized mining as the American Mining Congress. Its efforts in this matter are built around the Cincinnati meeting. The best evidence of the importance of the meeting and the results obtained is the remarkable growth of mechanization with the accompanying benefits to operator and manufacturer alike.

W. D. Brennan,

President and General Manager, Utah Fuel Company.

"To western men the exposition means that we are able with one trip to see what would otherwise require an impossible amount of time."

THE Annual Convention of Practical Coal Operating Men, which has been held in Cincinnati early in May for a number of years past, has become an important event in the yearly calendar of the coal industry. To operating officials whose activities are hundreds of miles away from Cincinnati, this is their spring mecca. Recently, when in Seattle, Wash., in talking to operating officials whose properties are in that locality, almost one of the first things mentioned was the Cincinnati convention.

To western men, who only occasionally are able to go East, the concentrating of all machinery and mining equipment in the exposition hall means that we are able with one trip to see various appliances which would otherwise require an impossible amount of time to ferret out.

Everyone who attends one of these conventions brings back to his own organization, as well as to his fellow operators, practical thoughts and suggestions obtained there which are of great benefit to the industry.

I know it is the wish and thought of every coal man that these conventions continue and increase in magnitude from year to year.

A. B. Kelley,

General Manager, Humphreys Coal & Coke Company.

"The amount of knowledge and information acquired is limited only by the capacity to absorb."

TO those who have attended an American Mining Congress convention at Cincinnati no recommendation is necessary. This brief statement is directed to those who for various reasons have not attended.

Outside the walls of our universities, the educational advantages offered by this Cincinnati convention to the coal-operating fraternity are unequaled. The theoretical side is represented in the lectures; the practical side in the exhibits. It may well be termed a coal-operating clinic.

These activities are national in scope. While problems may be of local importance they are scrutinized from a cosmopolitan viewpoint. This is a pertinent recommendation, because plant officials must necessarily by their imposed duties suffer a severe isolation. Subjected to

these detachments, their minds become parochial unless they make use of a stimulating medium. The best medium to jar their minds from the rut of provincialism is the Cincinnati convention of the American Mining Congress.

To take full advantage of all opportunities will provide a strenuous week for the neophyte. It is worth it. The amount of knowledge and information acquired is limited only by the capacity to absorb.

The coal operators do not fully appreciate the exposition. I have on numerous occasions taken laymen through the hall of exhibits. Their reaction was one of astonishment and amazement. They had had no idea of the stupendousness and completeness of the exposition. A layman after studying the exhibits and their application could reconstruct a coal mine.

At the end of the week one may be tired, but he will leave with a feeling of mental exhilaration.

Aside from these is the opportunity for personal contacts. When 4,000 operating officials gather, officials who represent the coal industry from every coal field in the United States, Canada, Mexico, and distant foreign fields, there is the invaluable opportunity of making personal contacts. The value of such contacts is immeasurable. There can be no progress without them.

G. W. Hay,

General Manager, Elk Horn Coal Corporation.

"Enough cannot be said of the experience to be gained in attending The American Mining Congress Cincinnati meetings."

THE meetings held in Cincinnati by the American Mining Congress are an inspiration to coal men. Under present conditions in the coal industry all operators are forced to reduce mining cost, which can be and is done by various improved mining methods and systems. The larger corporations, or those in better financial circumstances, can introduce the more modern types of machinery and equipment, while the smaller companies must resort to less expensive methods. The experience gained by the larger corporations, using the more modern systems of mining, is clearly demonstrated at the meetings held and give all those interested a clear picture of what can be expected and what is to be gained by the introduction of the most modern equipment.

The discussions are most beneficial and instructive and give us splendid thoughts to ponder over in working out our own individual problems. To start with, we have a general idea of the experience of

others, which helps solve our problems with little expense. Were it not for those meetings and discussions it would be impossible to keep in close touch with the experience gained in the use of modern equipment.

The manufacturers' display of equipment is of great help to mining men. One can not express the many ways the latest improvements in various types of equipment, as well as recent inventions, assist the operators in the tasks before them. Operators who can not install the more modern type equipment in its entirety can improve their situation very materially by introducing the new devices just as far as it is possible to do so under the conditions.

Enough can not be said of the experience to be gained in attending the American Mining Congress Cincinnati meetings. To appreciate the benefits derived is to attend all of them.

Carl J. Fletcher,

President, Old Knox Mining Company.

"... a tremendous saving has been made by those who have availed themselves of the opportunities offered."

IT has been apparent to many operators for a number of years that large combinations of coal properties would not relieve the industry of its difficulties. It also appears that the generally accepted method of saving present investments by reducing the earning power of the individual worker is accompanied by the inevitable loss of cooperation which defeats the end sought. Such smaller factors as better selling methods, more careful preparation, and the education of the consumer in the use of the product are all of great interest and have helped many operators, but general application would only leave the industry in the present predicament.

With many larger companies suffering from the competition of the smaller independent operators, and with labor reduced in many places below a living wage, we are rapidly turning to the idea of increasing the productive capacity of the individual worker and relying more on better cooperation to solve our present difficulties.

The introduction of machinery has continued over a period of many years, but with the cutting machine, mechanical haulage, larger pit cars, and all the improvements we are familiar with, the production of coal was limited by the amount of coal that the digger could put in the pit car in a given time. In the last few years a means of increasing this limiting factor is being developed. Putting the coal in cars by mechanical means has brought so many new factors into the

production of coal that the operator has been unable to adopt the new machinery and methods without the danger of costly mistakes. Due to the many different loading devices in the process of development and the many changes in mining methods there has been an intense desire on the part of the individual to inform himself of this progress and to determine if possible whether the application of new methods would solve his particular problem.

During this period of most unusual development the American Mining Congress has undertaken to gather information regarding the progress made and to distribute it to the operator. They have been ably seconded in this program by the operator, who immediately recognized the value of this plan. In addition the American Mining Congress and the operators have arranged meetings where the operators came in personal contact and through carefully arranged programs exchange ideas, and were able to inspect and compare the latest developments in mining machinery. There is certain to be a growing realization of the benefits to be gained by the attendance at such gatherings and a realization that a tremendous saving has been made by those who have availed themselves of the opportunities offered.

C. M. Lingle,

Vice President, The Buckeye Coal Company.

"This meeting is the melting pot of operating ideas."

THE annual meeting of the American Mining Congress is important to practical coal operating men for several reasons:

1. The dissemination of information through authoritative sources of successful mining practices by successful mining men.
2. It is an opportunity for mining men from all over the country to meet and exchange ideas.
3. It renews contacts with old friends and presents the opportunity for making new friends in the industry; who discuss with each other failures and successes during the preceding 12 months, and has a stimulating effect on each and every man at the Congress.
4. The practical demonstration of the latest types of modern mining equipment and machinery in the showrooms of the Congress creates a desire for better and more efficiency for the individual operating man who observes it. It also gives the manufacturer's representatives the opportunity to discuss the merits of the equipment on exhibit with the operating men and get suggestions for improvement that will be of benefit to both.

5. This meeting is the melting pot of operating ideas. It is conducive to better management, better organization, better mining systems, and safer operating practices.

Horace Moses,

Manager, Gallup American Coal Company.

"... is without question of more interest and more benefit to those connected with the coal mining industry than any other."

THE Annual Convention of Practical Coal Operating Men and the National Exposition of Coal Mining Equipment is without question of more interest and more benefit to those connected with the coal-mining industry than any of the other conventions held. Not only do those attending the convention meet with others and discuss their different problems but they have the opportunity to inspect the most modern equipment used in and around the mines, which is of intense interest to those connected with the industry. It is a distinct advantage to be able to inspect the different types of mechanical devices which are on exhibit at the exposition.

F. S. Pfahler,

Vice President & General Manager, Superior Coal Company.

"... it never was as important to use the most modern machinery as at the present time. A visit gives an opportunity to see all kinds of modern machinery."

THE American Mining Congress at Cincinnati presents an unequalled opportunity, at a low cost, to the management of coal properties to take advantage of seeing not only what the other fellow is doing but what he is using.

It is practically a moving picture of modern machinery used in mining.

In my opinion, it never was as important for the management of mining properties to use the most modern machinery that will help solve his individual problems as at the present time.

One, two, or three days visit at this Congress gives not only those in charge but the underground management as well an opportunity to see all kinds of modern machinery that can and will aid those who are at the present time faced with some extremely serious problems to solve.

I consider this display not as a selling agency but a program that is constructive when the management of mines can take advantage of such opportunities as are presented at the American Mining Congress at Cincinnati.

Dr. L. E. Young,

Vice President, Pittsburgh Coal Company.

"There have been no national gatherings at which more helpful papers and discussions have been presented than at Cincinnati."

THE Annual Convention of Coal Operating Men in connection with the National Exposition of Coal Mine Equipment affords an unequalled opportunity for the exchange of ideas and data on various phases of coal mining. In reality it has become a convention on production engineering as applied to coal mining.

The meetings of previous years have served to stimulate the operating officials who have attended, and in many instances have given them a new or wider vision of their responsibilities and opportunities. The person seeking information or assistance along a particular line can usually secure it; in the past there has been special emphasis on certain subjects. There have been no national gatherings at which more helpful papers and discussions have been presented than those at Cincinnati, particularly on (1) the adaptability of machines to underground conditions, (2) the development of efficient and safe practices, and (3) the intensive use of equipment. Incidental to these major topics there have been real contributions on the application of electricity and the economical use of materials and supplies.

While the mechanization movement as applied to coal mining has received most attention in the past, there has been ample opportunity for the presentation of methods and ideas used successfully in other industries. In this way it has been possible for the committee in charge of the exposition to give the operators a chance to keep pace with the progress being made elsewhere.

The program and plans for the 1931 convention and exposition will include the essential features of previous years and a number of new ideas that should result in even greater interest among the coal-mining fraternity.

A. M. Fine,

Vice President, Hudson Coal Company.

"... most helpful to those attending in aiding them to keep in step with the march of progress."

THE interchange of ideas, information, and experiences and the inspection of equipment, such as occurs at the Annual Convention of Practical Coal Operating Men and National Exposition of Coal Mining Equipment at Cincinnati, will be most helpful to those attending in aiding them to keep in step with the march of progress in coal mining.

Eugene McAuliffe,*President, Union Pacific Coal Company.*

"... invariably represents a substantial contribution to mining technique. . . . The contribution made by the manufacturing companies should not be overlooked."

IN my opinion, there are two definite reasons why men connected with the executive and operating departments of coal-mining companies should attend the Annual Convention of Practical Coal Operating Men held annually in Cincinnati under the auspices of the American Mining Congress:

1. The papers presented, and more particularly the discussion, largely prepared, read, and conducted by practical men, invariably represents a substantial contribution to mining technique.

2. The mining industry is under a distinct obligation to the mining machinery manufacturers whose years of intensive research, coupled with engineering ability of the highest order, has brought to the coal-mining industry, more particularly within recent years, machines of so many types as to now well meet every requirement of the industry. The contribution made by the electrical manufacturing companies as well as those supplying the thousand refinements necessary to mine operation, including safety apparatus, permissible explosives, etc., should not be overlooked.

A. J. Musser,*Vice President & General Manager, Clearfield Bituminous Coal Corporation.*

"The contacts made are productive of much good. . . . Many vexing problems are cleared up by the informal discussions which develop."

THE Annual Convention of Practical Coal Operating Men, held in Cincinnati under the auspices of the American Mining Congress, we have found of inestimable value to our higher officials, as well as to our foremen, mechanical and electrical engineers, as well as our other technical men. In connection with that convention, the exhibition and demonstration of every worth-while piece of mining machinery and equipment has been a means of valuable instruction, and the subjects there presented and discussed in the meetings have been intensely interesting and helpful. Of course, everything there presented and discussed can not be fully absorbed at the time, but when the convention is subsequently fully reported in THE AMERICAN MINING CONGRESS JOURNAL, and the papers and discussions reviewed in that JOURNAL, then the men who had the privilege of hearing

such discussions review the various subjects printed in the JOURNAL and thus get the utmost benefit.

The contact our men make at your annual conventions with mining men from other sections of the country is productive of much good. Many vexing operating problems are cleared up by the informal discussions which develop among other operating men while in attendance at your annual convention. Such discussions are frequently the outgrowth of subjects formally discussed in the meeting.

Our experience has been that a superintendent, foreman, or engineer sent to the Cincinnati meetings returns to his work with a renewed interest and better informed and equipped to efficiently proceed with his work.

Wm. P. Cayton,*President, Rail & River Coal Company.*

"... any expense incurred by an operator in sending men comes back to him many times."

IN my opinion, this is the most important meeting of coal men held during the year, and I feel that any expense incurred by an operator in sending men of his operating staff to it comes back to him many times, due to increased interest and efficiency of the men attending.

These men have the opportunity of hearing the many interesting papers and discussions, seeing the latest in the way of equipment, to say nothing of the benefit gained by meeting others in the same line of work and discussing problems which are common to all.

D. D. Muir, Jr.,*Vice President & General Manager, United States Fuel Co.*

"No man in attendance can help but gain by a comparison of his operations with the picture set before him."

THE American Mining Congress Annual Convention of Practical Coal Operating Men and National Exposition of Coal Mining Equipment at Cincinnati brings together each year the largest number of coal-mining executives, operating officials, engineers, and manufacturers of equipment ever assembled for a meeting of this character. It follows that at such a gathering a splendid opportunity is afforded to observe the trend of progress in coal-mine operation.

From papers, an exchange of views and discussion of all phases of coal mining by outstanding officials, the experience of the industry becomes available. Contact is afforded with men from organizations

of the progressively managed properties of the country; from the mines meeting with the most success in mechanized mining, in low cost operation, and in safe working.

No man connected with coal mining in attendance at the convention can help but gain by a comparison of his operations with the picture set before him of the methods used in the leading mines of the country, nor can he come away without carrying with him a mental catalogue of the cost-saving equipment and machinery displayed in the great exhibition hall.

George B. Harrington,*President, Chicago, Wilmington & Franklin Coal Co.*

"... nothing stimulates a man's mental processes so much as a chance to meet and discuss problems and to see first hand improvements in equipment."

THERE are so many features in which the Cincinnati convention of the American Mining Congress is of value to the coal-operating men that it would be impossible to touch upon more than one or two of the high points.

The average operating man at the mine has so little opportunity to get away from his own particular problems that he very shortly becomes extremely narrow and limited in his ability to develop new ideas. While, of course, considerable benefit is gained through reading the coal-trade papers, nothing broadens a man's point of view or stimulates his mental processes so much as a chance to meet and discuss problems with other operating men and to see first-hand the new improvements in mining equipment and machinery.

Without some definite objective such as the Mining Congress convention, the operating men at the mines may go for years without getting away from the plants in their immediate vicinity. This feature of the convention alone makes it exceptionally worth while, in my opinion.

J. G. Puterbaugh,*President, The McAlester Fuel Company.*

"I know of no way in which operators can get anything like as much help for twice the investment of time and money."

IREGARD the annual meetings of practical coal operating men, held at Cincinnati annually under the auspices of the American Mining Congress, as very helpful. The papers that are read develop the best thought of the industry in respect to the subjects in which the industry is most interested at the time.

The very complete exhibits of mining equipment enables both executives and technical men to keep in touch with progress and the various mechanical devices and the improvements that are being made in them from year to year.

In addition to the above, this meeting affords practically the only opportunity for those engaged in the coal-mining industry to meet with one another and to exchange views and continue old friendships and make new ones.

I know of no way in which coal operators and their operating men can get anything like as much information and help for twice the investment of time and money as by attending this meeting.

Edward Bottomley,
General Superintendent, Sheridan-
Wyoming Coal Company.

"I don't know of any other opportunity I would have to see modern mining machinery demonstrated to such an extent."

THE Annual Convention of Practical Operating Men, held in May at Cincinnati, is a most helpful event. Every operating man attending these meetings should derive a great deal of benefit; at least, I personally feel that I have benefited to some extent at every meeting I have attended, for I don't know of any other opportunity I would have to see modern mining machinery and equipment of every description demonstrated to such an extent as I have seen at the Cincinnati conventions.

Then again, these meetings afford an opportunity to meet with and exchange ideas with many practical operating men in the mining industry that otherwise one would never have.

K. A. Spencer,
Treasurer & Chief Engineer, Pittsburgh
& Midway Coal Mining Company.

"Time is an element . . . the few days spent in Cincinnati gives in the shortest time an insight of what the mining industry at large is doing."

I FEEL that during the past rather depressed conditions of the coal-mining industry, all men holding positions of responsibility have been unusually busy. During these times they have concentrated on their own problems and the routine detailed work immediately before them, in an effort to reduce costs and increase sales.

Time is an element, and I believe the few days spent in Cincinnati at the Mining Congress gives them, in the shortest

possible time, an insight of what the mining industry at large is doing, and in the few days spent hearing the papers from all sections of the country, along with the splendid display of the most recent developments in mining equipment, the practical mining men can post themselves as to modern trends and, as a matter of sheer economy, can, at the least expense, acquire this information and knowledge pertaining to the best way to do a certain job, as determined by another's experience.

I feel the contacts made at these meetings are valuable and that the convention should be patronized by all the responsible, progressive mining men of the country.

Louis C. Madeira, III,
Madeira, Hill & Company.

"Great benefit comes from such an exchange of views."

EACH spring I look forward to the annual convention of the American Mining Congress, held in Cincinnati for the last six or seven years.

There is no meeting of its kind held anywhere, to my knowledge, where practical operating men and the manufacturers of mining machinery and mine equipment meet to discuss informally mutual problems. Great benefit comes from such an exchange of views, in that modifications in design are discussed and explained to the end that the particular machine in question is revamped to meet practical conditions and removes what seemed to be obstacles.

From the operator's point of view, the mechanical engineer or mining engineer that attends for his particular company sees for the first time some new device that, due to daily routine, has never come to his attention. Or else, from the acquaintance of a new article, a new thought comes to his mind that aids him in reducing his operating costs.

Dorr thickeners, concentrating tables, and similar devices so prevalent in the metal mines might have been years be-

fore they gained admission to the anthracite industry if it had not been for the fact that they had representatives at these conventions.

Each company should be represented by one or more of their staff at these gatherings. If nothing else is gained, a broadening of acquaintanceship will be worth the time and money spent.

Wesley S. Harris,
President, Bicknell Coal Company.

" . . . operating men who attend will be amply rewarded if they apply themselves to the job as they expect their employees to do to theirs."

THE tentative program for the Eighth Annual Convention of Practical Coal Operating Men indicates promise of this meeting being another valuable contribution to modern coal-mine management.

Because of the trend in recent years to mechanization, this subject has received well-deserved, though over-emphasized, consideration. The program this year is better balanced.

It is well to recognize the fact that mechanization alone is not the solution to the problem of efficient and profitable operation, and to turn our attention for a while to other equally important phases of the industry.

The meeting opens with a discussion of the subject, "Modern Coal Mine Management," which should emphasize the importance of such matters as special training for man direction, technology and research work, as well as the practical application of well-established practices.

It closes with a discussion of the subject, "Recent Developments in Mining Practice," which should be both instructive and profitable. Sandwiched between these two important subjects will be pie suitable for every taste.

Practical coal operating men who are privileged to attend this school will be amply rewarded for their trouble if they apply themselves to the job as they expect their employees to do to theirs.



NON-PRODUCTIVE LABOR in Mechanized Mining

By G. B. Southward

In mechanized mining studies should be made to show what proportion of the working shift is lost through delays, unnecessary work, or time wasted.

MODERNIZATION of coal mining is being brought about through the adaption of machines to all the underground operations, and it is being found that the use of mechanical power is more economical than man or animal power. This is true as a general proposition, but whether or not it is true when applied to an individual mine depends altogether on the amount of work done. If the actual performance does not closely approach the capacity of the machine, the operation will very likely be uneconomical; at least there will be a production loss and an increased operating cost which should not occur. It is hardly to be expected that any machine can ever be operated continuously at its full capacity, but in order to develop the greatest possibility of mechanization, we must first determine how closely the potential capacities of the men and the machines can be approached.

In making this determination we have to take an entirely different viewpoint from that used in judging a hand-loading mine. We have already found out that a machine operation necessitates changes from hand-loading practices in every department underground. New mining methods require new methods of organizing the labor employed and the production or performance standards for measuring labor efficiency with hand loading are not applicable to a machine operation.

There are several basic differences between hand and mechanized mining. A hand-loading mine is composed of a large number of small producing units, while a machine operation consists of a small number of large producing units. The production of a hand loader varies between different men in the same mine and between the same men on different days, while a machine is capable of giving a regular and continuous performance. With hand tools the men are selected by their ability to stand up under hard work, and the main effort of management is to

keep the men busy. With power tools the effort of management must be directed toward selecting the proper machines for the work and keeping them employed productively—not merely keeping the men busy. For example, a man using a breast auger is busy as far as muscular effort is concerned. So is a dog scratching fleas; but neither one accomplishes very much.

In any mine the final measurement of efficiency is the number of tons produced per man employed or, expressed reversely, the number of man-hours required to produce a ton. These figures when shown on the cost sheet necessarily include the total number of man-hours employed, irrespective of whether all this time is productive or not. In order, therefore, to find out whether the unit or mine is operating at the degree of efficiency which can be expected, it is necessary to analyze the cost or the man-hour figures. This requires a detailed time study as the real index of efficiency in any operation is the proportion of the shift which is spent in productive work.

The terms "productive" or "nonproductive" time or work requires some definition. In a narrow sense, "productive" is used to describe only those operations which directly result in producing coal; as, for instance, cutting and loading. This is not a fair or correct definition, as everything which is done underground is a necessary part of the chain of operations from the face to the tippie and each operation is either directly or indirectly productive.

The real definition of "nonproductive time" is time lost through delays, time spent in unnecessary work, or time wasted through a lack of proper balancing or coordinating of the various operations. All of these losses are now occurring to some degree in mechanized mines, and the first step in their elimination or reduction is to make a time study and an analysis of all work performed so as to divide the labor employed in the entire operation into its component parts. The second step is to determine what part of the time losses or non-productive work is a necessary or an inherent part of the system used.

One source of a time loss with a mobile

machine in room-and-pillar mining is when the operation moves from one working place to another. A second and a greater time loss is the delay to the machine while waiting for a loaded mine car to be taken away and replaced with an empty. These two delays combined will often amount to over 50 percent of the working shift.

In a long-face operation with conveyors or scrapers it is the usual practice to do the loading on one shift with the cutting and other preparatory work on the second shift. With this type of mining there will be delays during the loading shift if the mine-car delivery is not scheduled properly. There may also be labor wasted through lack of proper balancing between the amount of work done by the various crews.

The greatest amount of nonproductive time in a long-face operation usually results in the work done in securing a favorable roof action. This has been discussed in previous articles but is mentioned here to emphasize the necessity of designing the mining systems in accordance with the natural roof conditions rather than against them. The cost of supporting the roof in long-face mining has in a number of instances been so great that the system was discontinued. If the wrong method of roof support is used the work done is certainly nonproductive.

In room or entry mining with conveyors or scrapers, where several complete cycles are made during the shift, there is apt to be a time loss in changing the men from one operation to another. This may not be so serious, although like falling from a high building it is the stopping that hurts. A greater loss is apt to occur through the operations being out of balance—the cutting crew may have to wait on a cleanup, or vice versa. Another example of non-productive work in conveyor mining occurs where there is an undue amount of spillage resulting from overloading, leakage, or lack of a proper hopper where one conveyor discharges onto another.

It is not the intention of this article to say that all of the nonproductive time mentioned can be eliminated. It is more to suggest that careful analysis should be made of an operation, keeping in mind to determine what is productive and what is not. In making this distinction it should be emphasized that a great many of the things which are being done unnecessarily in mechanized mines are simply the result of holding to hand-loading standards or practices and not taking the fullest advantage offered by a mechanical operation.

PRACTICAL OPERATING MEN'S DEPARTMENT COAL

Practical Operating Problems of the Coal Mining Industry

NEWELL G. ALFORD, Editor

BLOWER and TUBING for Ventilation of Double Entry Driving and Special Rock Tunnel Work

By E. C. Berkeley*

THE Youghiogheny and Ohio Coal Company is just beginning the development of a new mine on its Van (West Virginia) property which, by next summer, will yield about 1,000 tons of splint coal daily on a one-shift, eight-hour operating schedule. To attain full development and achieve full production with a minimum of delay, entries are being pushed with all possible speed. Du Pont Ventube has been used for auxiliary ventilation in connection with this development work, and its use has helped materially in establishing what is believed to be an outstanding record for high-speed entry driving by hand-loading methods.

On standard double-entry work, for example, this mine's records show one period of 56 operating days (112 shifts) during which 650 ft. of 8 $\frac{1}{2}$ x 12-ft. double entry was driven using two miners and two helpers per shift. In another case, two men employed on a contract basis and working one shift per day drove 1,300 ft. of 6 x 12-ft. rock tunnel, single

entry, in a period of about one year and at a total cost of less than \$3,540. This operation would have been practically impossible on any but the single-entry basis but, assuming that a double-entry tunnel had been driven, the cost would have been slightly more than twice as great.

STANDARD DOUBLE-ENTRY METHODS

General Layout.—Double entries are being driven directly from the hillside with haulageways and airways on 60-ft. centers and break-throughs every 80 ft., in accordance with West Virginia State mine laws. Each entry is 12 ft. wide and about 8 $\frac{1}{2}$ ft. high. The seam is 60 in. deep at this point, and there is usually about 45 in. of rock which must also be removed.

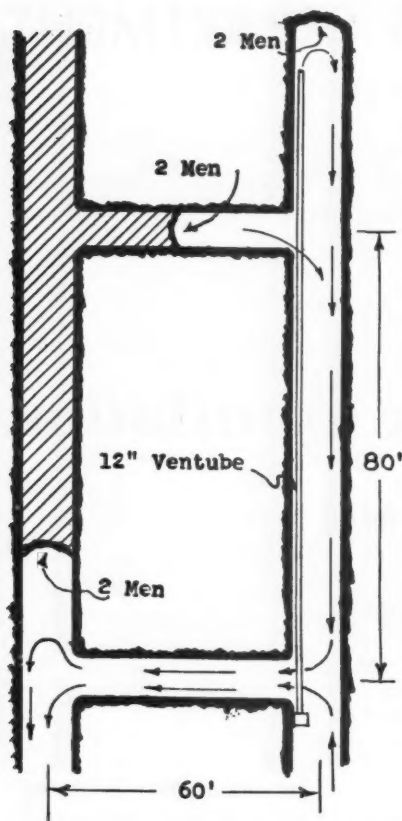
Working Methods.—Entry driving is usually done on a two-shift basis. Two men are regularly employed in each section of the entry, with one two-man crew one full break-through ahead of the other. Break-throughs are driven from the advanced side in every case, usually by a two-man crew brought in for this purpose from near-by room-and-pillar operations. The crew working in the lagging

entry is never over 80 ft. from the main air stream and gets ample fresh air without auxiliary ventilation of any kind. The crew in the advance entry and the men doing break-through work are sometimes as much as 150 ft. from the main stream, however, and auxiliary ventilation is an important consideration in their case.

Ventilation Equipment.—One motor-driven blower equipped with from 150 to 200 ft. of 12-in. tube offers an ideal solution for the auxiliary ventilation problem in entry driving. This mine has adopted 150 cu. ft. of air per minute as the minimum quantity to be supplied for each man served, and no difficulty is had in reaching this minimum under all conditions. The blower units are usually set up in the advanced entry opposite the last complete break-through, so that auxiliary air may be drawn directly from the main stream. With four men at work on the advanced side, two at the entry face and two in the break-through, it has been found possible to provide good working conditions for all by delivering 600 cu. ft. of air per minute at the entry face; this is more than enough to take care of the entry crew proper and the counter-flow through the entry creates a sufficient suction to draw smoke, dust, and fumes out of the partially completed break-through.

Tubing of 12-in. size was formerly bought in 100-ft. lengths, but 25-ft. lengths have recently been found slightly

* Superintendent, Youghiogheny & Ohio Coal Company.
Prepared in cooperation with A. C. Nielsen Company.



Sketch showing use of ventube for auxiliary ventilation on entry driving

more convenient. Wooden pegs set in the rib close to the roof carry small wire hooks, from which the Ventube messenger cable is suspended. One man can ordinarily bore stake holes in the rib for a 25-ft. length of tube and erect wire and tubing, ready for service, in about 20 minutes. It is the practice at this mine, however, to make the actual suspension a two-man job, since this permits keeping the tubing stretched between them and completely out of contact with water and dirt which might unnecessarily hasten its deterioration.

As compared with this mine's experience in handling entry driving work without auxiliary ventilation, the use of tubing offers numerous advantages. Most of the gains are due more or less directly to the fact that smoke, dust, and fumes always present after shooting are now very quickly removed.

Under the normal entry driving schedule, one round of shots is fired in the coal and one round in the rock on each shift, the latter coming as soon as the men can clear away coal brought down by the first round. There are thus two periods of smoke presence on each shift, but the men can return to work in perfect comfort after a wait of not more than five minutes. Visibility is fully restored to normal at the end of that time

and there is no possibility of respiratory trouble.

Working conditions existing prior to the introduction of the blower and tubing were in strong contrast to those which now obtain. It was frequently necessary to delay loading operations for as much as one hour following a round of shots before auxiliary ventilation was introduced. In some places, where the entry level rose slightly in the direction of advance, smoke was trapped and held right at the working face over night.

Entry Driving Records.—The simultaneous driving of entries and the possibility of quick returns to the face after shooting have aided this mine in setting records for entry driving. For example, from October 23, 1928, to the end of that year—a period of 56 operating days, or 112 shifts—the mine records show 650 ft. of 8½ x 12-ft. double-entry work completed. This is practically double the rate formerly established without tubing ventilation and is believed to represent the highest possible operating efficiency under hand-loading methods. The mine management is firmly of the opinion that the personal efficiency of its men has been increased by 50 percent as a result of proper ventilation; this is clearly indicated in the progress reported on entry driving and also in the fact that an unusually good record has been made in the matter of accidents. The advantages of this greatly increased speed in entry driving, permitting full development and

normal production to be reached in the shortest possible time, will be clearly apparent to all familiar with this work even though no direct dollar valuation of the gain can as yet be established.

ROCK, TUNNEL WORK

The value of the tube system on single-entry work is strikingly illustrated in the case of a rock tunnel recently completed at this mine. A situation arose which made it desirable to connect the present workings with another property some distance away around the hillside. The location of the tippie and the severe slope of the hill would have made it difficult and prohibitively expensive to build a roadway around the hill, so it was decided to establish the desired connection by means of a tunnel. The distance over the tunnel route was 1,300 ft., and haulage requirements called for a 12-ft. tunnel with 6-ft. clearance. The availability of Ventube equipment made it a simple matter to drive a single-entry tunnel, and the double-entry system was not at that time regarded as a possible alternative.

Single-Entry Methods.—The rock-tunnel work was done on a one-shift basis with a miner and one helper working on a contract basis. Under the terms of this agreement, the men received \$2.16 per yard of advance plus \$.80 per ton for all coal produced. The coal, largely unmerchantable, averaged about 2 tons per linear foot of tunnel. The agreement

YOUGHIOGHENY & OHIO COAL COMPANY

Savings Effected by Use of duPont Ventube for Ventilation on Single-Entry Rock Tunnel Work

General Data and Unit Costs			
Tunnel dimensions:			
Width of entry	12 ft.		
Height	6 ft.		
Total length	1,300 ft.		
Coal yield per foot of digging	2 tons		
Contract terms:			
Unit payment per ton coal	\$0.80		
Unit payment for rock, per yard advanced	\$2.16		
Comparative single- and double-entry data:			
Method considered	Single	Double	
Break-throughs required (80-ft.)	none	15	
Break-through length—minimum		48 ft.	
Linear ft. of tunnel:			
Main ways	1,300 ft.	2,600 ft.	
Break-throughs—15 @ 48 ft. each		720	
Totals	1,300 ft.	3,320 ft.	
Estimate for Double-Entry Method			
Coal removal—3,320 ft. x 2 tons/ft. @ \$.80	\$5,312.00		
Rock—3,320 ft. @ \$2.16/yard	2,390.40		
Total			\$7,702.40
Costs by Single-Entry Method			
Coal removal—1,300 ft. x 2 tons/ft. @ \$.80	\$2,080.00		
Rock—1,300 ft. @ \$2.16/yard	936.00		
Auxiliary ventilation (for 1 year):			
Fan and motor—			
Depreciation—\$135 ÷ 5-yr. life	\$27.00		
Average interest @ 6%	4.86		
Ventube (52 lengths of 25 ft. each):			
Depreciation—\$728/yr. x 6.5/12	\$394.33		
Interest @ 6% for 6.5 months	26.66		
Repairs and maintenance allowance	50.00		
Power—estimated maximum	10.00		
Ventube erection labor—			
18 hr. @ \$.57	10.26	523.11	3,539.11
Savings Effected			
Net, on complete tunnel (also per year)			\$4,163.29
Cost reduction		64.0%	
Net return on investment (1 fan—1,300 ft. Ventube)		482%	

further provided that the contract crew handle hauling, track-laying, and other necessary incidental operations as well as drilling, shooting, and loading; the operating company, for its part, agreed to provide proper ventilation—not less than 300 cu. ft. of air per minute—and to pay the direct labor costs of erecting and maintaining the ventilating equipment.

Alternative Double-Entry Method.—As has previously been pointed out, the double-entry method would have done away with the need for forced ventilation, but was scarcely to be regarded as a practical alternative for several reasons. The principal point against this was the fact that the coal in the parallel tunnel, near the crop line, would have been wholly unmerchantable. It is interesting, however, to compare the single and double-entry methods as a means of establishing the value of blower and tubing on work of this kind.

Had the double-entry system been used, it would have been necessary to cut break-throughs every 80 ft. to comply with the mining laws. Assuming a 60-ft. center-to-center spacing of parallel 12-ft. tunnels, the break-throughs would have been at least 48 ft. long. Tunnel excavations in the direction of advance would have been 2,600 instead of 1,300 ft., and in addition there would have been at least fifteen 48-ft. break-throughs which add 720 ft. more. A total of 3,320 ft. of excavation would thus have been required to establish a haulageway 1,300 ft. long. Furthermore, the use of double-entry methods would have necessitated a considerable expenditure for piping and pumping to remove water from low spots in the two entries, and there would have been considerable timbering at points where the roof was weakened by break-throughs.

Comparative Costs.—With the double-entry method the yield of largely unmerchantable coal would have been 6,640 tons and the cost of its removal, at \$.80 per ton, would have been \$5,312. Rock removal at the stated rate of \$2.16 per yard of tunnel would have cost \$2,390.40. The total of these two items is \$7,702.40, and it must be noted that this does not include additional piping, pumping, and timbering costs which might also have been incurred.

Corresponding items for the work as actually done are \$2,080 for coal and \$936 for rock work. To these must be added the costs of operating and maintaining the Ventube system.

Depreciation and average interest charges are figured on the basis of a five-year life for an investment of \$135 in one fan and motor unit. The single-entry tunnel required just about one year

of continuous work, and these items are chargeable directly on the annual basis. Ventube of 12-in. size was obtained at \$14 per 24-ft. length, and 52 such lengths were ultimately required for the 1,300-ft. drive. Those lengths near the fan which had been in service for one full year at the completion of this job were in good condition at the end of the period, and it seems fair to calculate depreciation and average interest charges on the basis of a one-year life. It must be noted, of course, that the entire 1,300 ft. of tube was not in service for an entire year, some of it having been used at the advanced end of the tunnel for one week or less. The average period of use has been calculated from best data available as 6.5 months, and depreciation and interest charges are included on this basis.

There were no major repairs to any portion of the tubing itself during the entire period of service, and the motor-blower unit received very little attention. For the sake of conservatism, however, an allowance of \$50 has been set up to cover all possible costs of this kind.

Power was supplied from the mine circuits; this company operates its own steam plant for power generation and considers this a wholly unimportant charge in the case of a single fan unit. Again, for purposes of conservative comparison, an estimated power charge has been included. The total requirement could not have exceeded 500 kilowatt hours and the total cost, at an assumed figure of \$.02 per kilowatt hour, was thus \$10 or less.

The labor for the tube erection required not more than 18 hours of labor by one man employed by the operating company. His hourly rate was \$.57, and the total erection labor cost is thus \$10.26. The total of the items detailed above is shown in the accompanying tabulation as \$523.11, and this charge, added to the rock and coal removal cost, gives a grand total of \$3,539.11 for the single-entry tunnel.

Savings Effected.—No estimate is available of the possible schedule on which the alternative double-entry drive could have been made, and it is therefore impossible to state what, if any, time saving occurred through the use of single-entry methods. A direct cost comparison is possible, however, and the difference between the totals mentioned in the preceding section is shown in the accompanying tabulation as \$4,163.29. This represents a cost reduction for the entire tunnel of approximately 54 percent and, since the work required one year, this saving represents a net annual return of 482 percent on the total investment of \$863 in blower and tube equipment.

ACID COAL-MINE DRAINAGE PROBLEMS

Studies of the chemical and physical factors which influence the formation of acid drainage in coal mines, which have been conducted by the Pittsburgh Experiment Station of the Bureau of Mines, have shown that worked-out and abandoned sections of mines usually contribute the major part of the acid. These studies have also indicated that the quantity of acid produced by these sections may be inhibited and in time eliminated by sealing and excluding air from these sections. The seals need not retain water, which in some situations would constitute a menace to safety of persons and property, their function being merely to exclude oxygen which is necessary for the formation of acid from the iron sulphide in the coal and other strata exposed by normal mining operations or by caving.

This apparent means of reducing acid coal mine drainage is being further studied at the present time. Worked-out or abandoned sections of mines are carefully examined to obtain a record of their present conditions, after which they will be sealed. After sealing, observations will be made periodically over a number of years for changes in the quality of the water from these sections.

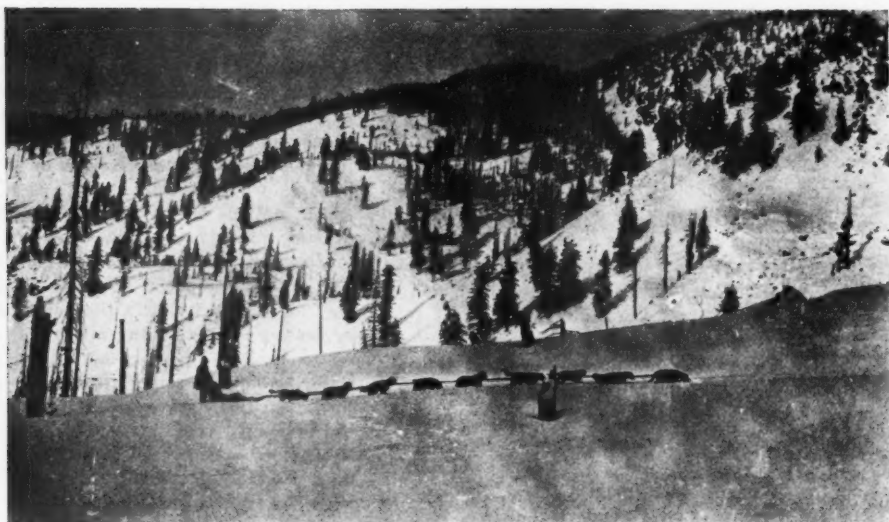
This means for reducing the acid content of coal mine drainage is also being seriously considered by the Pennsylvania State Sanitary Water Board and the Bituminous Coal Mine Drainage Board. These boards are making a study of the abandoned coal mine situations with a possible view of following the sealing procedure.

EXPLOSIVES ACCIDENTS IN ANTHRACITE MINES OF PENNSYLVANIA

A study of accidents due to the action of explosives in the anthracite mines of Pennsylvania has been made by the Bureau of Mines, the findings being given in Bulletin 326 by S. P. Howell, explosives engineer, recently published.

The principal objective of this study was to reduce accidents with explosives in the anthracite region. A necessary preliminary to this investigation appeared to be a study of the causes of such accidents. This report constitutes a large-size sample of these causes as taken from the Pennsylvania Department of Mines records. Suggestions are made for reducing or even eliminating the hazards of the different classes or types of accidents, and it is hoped that they will be utilized and supplemented.

Copies may be obtained from the Superintendent of Documents, Washington, D. C., at 20 cents.



Winter transportation of mail and supplies from Yellow Pine to Red Metals over top of snow many feet deep

THE



Red Metals, showing surface development in the winter of 1929-30



Red Metals in the summer of 1929, showing the portal to No. 4 tunnel (upper left)

PRACTICAL OPERATING MEN'S DEPARTMENT METALS

Practical Operating Problems of the Metal Mining Industry

GUY N. BJORGE, Editor

RED METALS PLANT—

Problems in Transportation of Equipment and Construction

By E. D. Hamacher*

PROPERTY of Amalgamated Red Metals Mines Company is situated close to Profile Gap, at altitude of 7,500 feet, in the heart of Valley County, south central Idaho. Until recently this section has been extremely isolated, with no communication facilities save the early day Thunder Mountain Trail. Latter-day construction of forest automobile highways into the district has, however, materially improved hitherto impossible transportation conditions for the better. This has made it possible to get in machinery and equipment essential to mining operations.

By the end of 1928 the forest service highway had been completed from Cascade, rail shipping point, to Yellow Pine, 61 miles distant, crossing in the interval two ranges at an elevation of approximately 7,000 ft. above sea level. By the spring of 1929 the highway had been extended up the south fork of the east fork of the Salmon River, a distance of 4 miles. This left 9 miles of narrow mountain trail to be negotiated up Profile Creek in delivery of supplies and equipment to the Red Metals property.

The company undertook construction of a first mill unit of about 20 tons daily capacity in 1929. Packing in of ordinary supplies presented no problem save high transportation costs; movement of even the lightest possible mechanical units presented considerable difficulty, particularly as the trail in places was extremely narrow, sliding and precipitous. Its course at times lay along steep sidehills where the slightest mishap meant disaster.

Some improvement of the more dangerous sections was undertaken before transportation of larger mechanical pieces was attempted. These, in the main, consisted of a 28-hp. gasoline power plant, a portable sawmill, one-drill air compressor and receiver; 3-ft. Pelton water wheel, Straub rib cone mill; two Overstrom concentrating tables; an assortment of large pulleys, long, heavy and cumbersome steel shaftings and counter shafts.

Each unit was dismantled to the fullest possible extent, so that the heaviest individual pieces to be moved weighed slightly more than half a ton. These were too weighty and awkward to be packed on the backs of the heaviest and strongest mules available. For their movement Stonebraker Bros., of Orofino, who held the contract, designed a special "go-devil," with a wide 8-in. wheel in front with drag behind the wheel. This somewhat clumsy arrangement worked admirably. Two husky mules pulling tandem, and a couple of super-strong men balancing behind, successfully negotiated the more ticklish sections of the trail without mishap, although the volume of sulphuric language, grunting, snorting and sneezing accompanying the effort can only be imagined by those having experience in such tasks.

Eventually, delivery of the entire plant was completed; each mechanical unit being reassembled at the mine, mill, or power plant as required.

Under such circumstances construction of a mill of 20 tons daily capacity was the limit of the undertaking. Even a plant of this size was justified only by the fact that previously established ore reserves of the Red Metals mine showed exceptionally high values. Mine-run gold values average \$43.78 per ton, with approximately equal values in silver (at currently depressed quotations for that metal). Company plans provide for commencement of milling and shipment of concentrates during the coming summer.

* President, Amalgamated Red Metals Mines Co., Spokane, Washington.



Pack horses loaded with steel pipe on the trail to Red Metals in the summer of 1929. 1,710 ft. of this pipe, welded when laid, furnishes water power from Quator Lake to the mill



Loading pack trains for Red Metals, June, 1929

MINING METHODS at the Eighty-Five Mines*

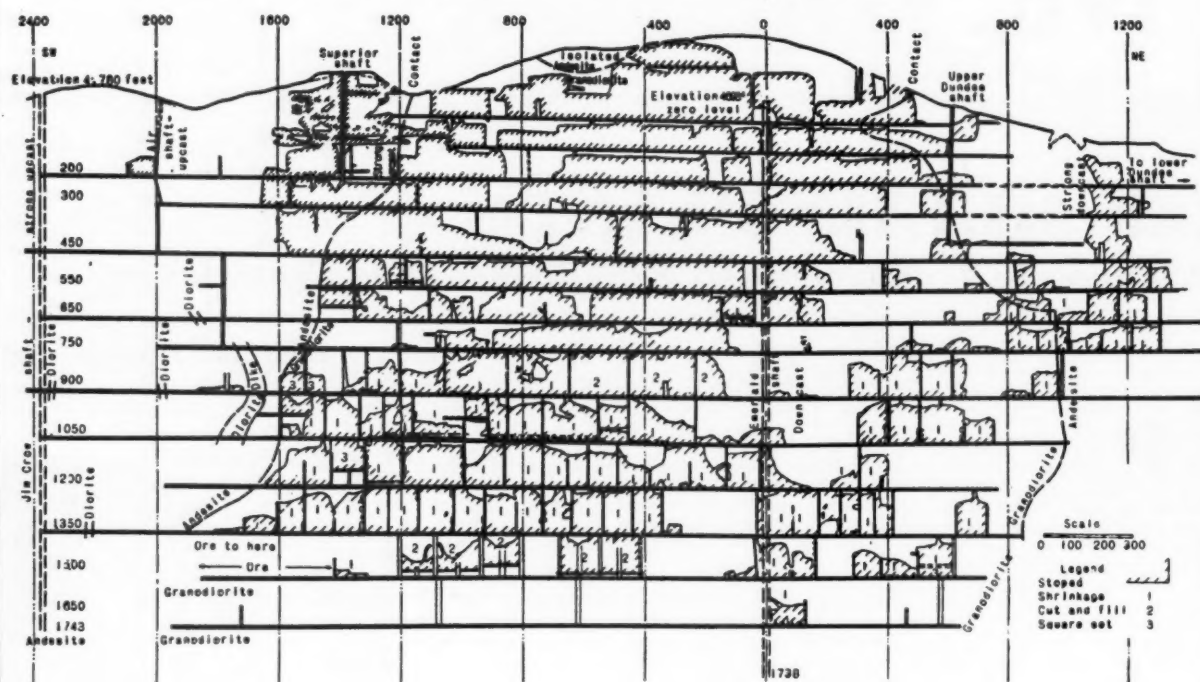


Figure 1. Longitudinal section of 85 Mine

By Ralph B. Youtz†

THE Eighty-Five mine of the Calumet and Arizona Mining Company, Valedon, N. Mex., is in the Virginia mining district, southeastern New Mexico, which comprises a large area 3 to 10 miles southwest of Lordsburg in the Pyramid Mountains. The group of 50 patented and seven unpatented claims owned by the Calumet and Arizona Mining Co., Eighty-Five mines, includes an area of 799 acres in the north end of the mountains. The mine and the townsite of Valedon are connected with the main line of the Southern Pacific Railroad by a standard-gauge spur from Lordsburg.

The Virginia mining district was first prospected about 1870. The Superior claim, now one of the Eighty-Five group, was located in 1875 by Morris Lesinsky

and Isaac A. Cohen. In 1880 the mining camp of Pyramid (Leidendorf) was located, 8 miles southwest of Lordsburg. Rich silver ores were found in the Viola (Venus) and Last Chance mines.

In 1881 the railroad was built through Lordsburg. This stimulated mining in the district to such an extent that the same year a smelter was constructed at Shakespeare 2 miles southwest of Lordsburg. In 1882 a 20-stamp, pan-amalgamation mill was erected at Pyramid; it operated for 10 years.

The Eighty-Five claim was located in 1885 by Samuel Ranson. Several years later it was acquired by Joe Leahy, of Lordsburg. In 1906 a Mr. Black, of Denver, bought the Eighty-Five group of claims from Leahy for \$40,000. He, in turn, sold the ground in 1913 to Warner Brothers, Yates, and Barclay, who organized the "85" Mining Co. This company built the town site of Valedon and the railroad spur from Lordsburg

to the mine. On May 1, 1920, the Calumet and Arizona Mining Co. bought the property from Warner Brothers, Yates, and Barclay.

PRODUCTION

Prior to 1913, when the Warner Brothers acquired the Eighty-Five mine, about 100,000 tons of copper ore had been shipped from the upper levels of the mine. From 1913 to May 1, 1920, about 520,000 tons was shipped, averaging 0.14 ounce gold, 3 ounces silver, and 3 percent copper.

From May 1, 1920, to July 1, 1930, 783,138 tons, averaging 0.111 ounce gold, 1.23 ounces silver, and 2.79 percent copper was shipped to the Douglas smelter of the Calumet and Arizona Mining Co. Production during 1930 continues at the rate of 7,000 tons per month.

The success of the mines has depended on the need of silicious fluxing ores at near-by smelters. The ore produced from

* Reprinted from the U. S. Bureau of Mines, Information Circular 6413.

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1913 to date has contained at least 67 percent silica.

GEOLOGY

All the rocks of the Virginia district are of igneous origin, and consist chiefly of andesite, diorite, and porphyries of similar composition. A coarse-grained, light-colored granodiorite, locally called monzonite, intrudes the andesite and diorite from below. One irregular stock of this monzonite is 2,000 ft. in width and 2,600 ft. long where cut by the Emerald vein, in which the ore bodies of the Eighty-Five mine occur (see *Figure 1*). In the western end of the mine several dikes of granodiorite and quartz diorite cut the andesite. On the outskirts of the Eighty-Five property and throughout the district the outcrops of rhyolite dikes are found.

A series of fractures of at least three separate systems traverses all three principal rocks. The earliest system and the most important economically has a N. 40 to 45° E. strike. The Emerald, Nevada Old 85, Carlos, Oakley, Bonney, and Miser's Chest are veins belonging to this group. A later system, striking from N. 75° E. to due east, with a steep dip to the south, cuts and frequently offsets the first. The veins of the district are mineralized fault fissures belonging to these two systems. The third system, the most recent, strikes N. 10° W. and faults both older systems.

The northeast system of veins apparently includes the only veins of economic importance, and the Emerald vein is the only member of the group that is mineralized continuously enough to make a large mine. It is a true fissure vein, striking N. 45° E., and dipping an average of 80° to the southeast. The dip tends in places, especially in the east side of the mine, to become vertical or even to reverse steeply to the north (see *Figure 2*). The vein can be traced on the surface for a distance of 5,000 ft. As shown in *Figure 1*, ore has been mined from it almost, if not quite, to the surface for a distance of 2,300 ft. along the strike. On the 1,500 level ore occurs for a distance of 2,600 ft. along the vein. The ore has been followed to a depth of 2,000 ft. The richer ore shoots tend to rake slightly toward the west. The vein in its course through the granodiorite is very regular; it ranges in width from 2 to 10 ft., with an average of 5 ft. At times, especially on the upper levels, the vein attains a width of 30 ft. Where the vein extends into the andesite in both directions along the strike, however, it tends to finger out; the ore bodies found in andesite are very irregular and are "spotty" in value.

The mineralization was probably the final result of magmatic differentiation, of which the diorite, andesite, granodiorite, and rhyolite were successive stages.

Physically the ore bodies are closely related to the granodiorite stock, as shown by *Figures 1 and 3*. More than 93 percent of the ore to date has been mined where the granodiorite formed one or both walls of the vein.

The vein filling consists of massive quartz, country rock replaced by sulphides, and silicified, altered, quartz-seamed rock containing stringers of chalcocopyrite and pyrite. Small amounts of calcite, hematite (specular and massive), barite, and rhodocrosite are included in the gangue.

Chalcocopyrite and pyrite are the principal primary ore minerals. Galena and sphalerite are found in scattered amounts on all levels. The distribution of values in the primary ores is remarkably uniform; the mineralization and the grade of these ores have varied little in the 2,000 ft. of depth developed. The ore limits within the vein are usually commercial, although some barren stretches of vein occur.

In the oxidized zones azurite, malachite, chalcocite, and chrysocolla have been the principal copper minerals; native copper, cuprite, and covellite were not uncommon. Oxidized ores were found chiefly above the zero level, now the main haulage adit and entrance to the mine. West of the main or Emerald shaft very little oxidized ore was found below the 200 level. East of the shaft oxidation and leaching are unusually erratic and at times remarkably complete. The porous, iron-stained quartz, containing secondary chalcocite, makes important ore bodies as deep as the 1,500 level, often under hundreds of feet of primary ores. Some cuprite and covellite are likewise found as low as the 900 level. In the leached areas the silver content is usually higher than in the unaltered zones. The gold content is very erratic;

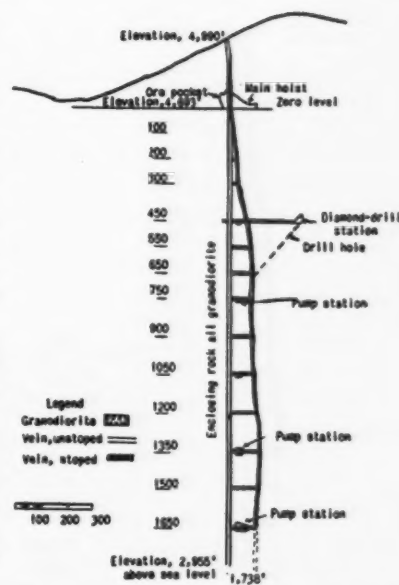


Figure 2. Transverse section through Emerald shaft and vein, looking north

stopes averaging 0.50 to 0.75 ounce per ton are sometimes mined directly under others averaging 0.08 to 0.10 ounce.

The vein material, composed of quartz, silicified country rock, and sulphide, is hard and stands without supports over wide spans. On rare occasions the hanging wall slacks or sloughs off to such an extent as to weaken the stope back, which may then break down in large blocks. This appears to take place chiefly in the stopes near the andesite-granodiorite contact in the west side of the mine. The ore is hard to drill, out breaks finely upon blasting, so that secondary blasting is seldom necessary in the stopes.

In the upper part of the mine both hanging and footwall are firm and will

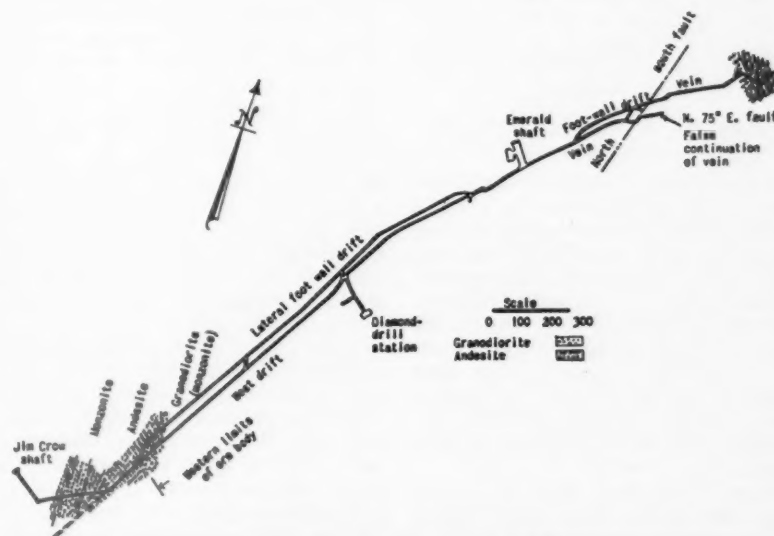


Figure 3. Plan of 1,350-foot level

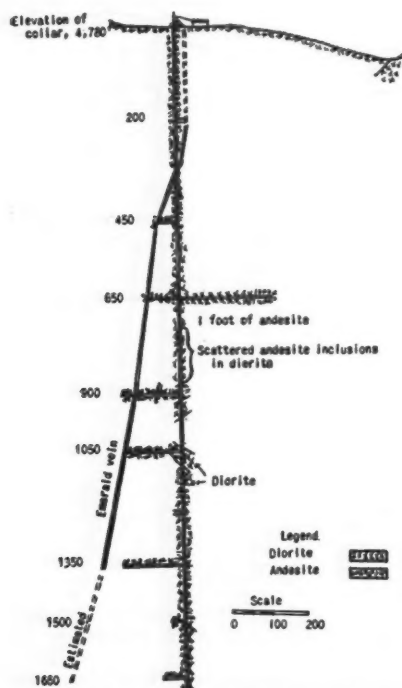


Figure 4. Section through Jim Crow shaft and Emerald vein

stand unsupported for considerable periods. Below the 1,350 level the walls are more mineralized and quite frequently thoroughly kaolinized. In some places this condition of the wall causes cut-and-fill mining to be used instead of shrinkage stoping.

Post-mineral movement along the vein, following its offsetting by the east-west faults, produced false continuations of the main vein, which were then mineralized by later and weaker solutions. Thus the main vein, as shown, for example, in Figure 3, at the east end, may appear to be pinching to a stringer, when in reality it has been faulted to the north. Therefore, in drifting and even in stoping, the main ore shoot is often lost unless operations are closely watched.

METHODS OF PROSPECTING AND EXPLORATION

Underground diamond drilling was done by the old 85 Mining Co. and also by the present management up to 1924. Horizontal holes were drilled into both foot and hanging walls to locate parallel veins. On the 450, 750, and 1,350 levels, on both the east and west sides of the mine, crosscuts 150 to 250 ft. long were driven into the hanging wall at right angles to the vein. From the ends of these crosscuts diamond-drill holes were drilled toward the vein to intersect it at depths from 150 to 500 ft. vertically below the drilling level. From two to four holes were drilled from each crosscut. Diamond drilling totaled 9,049 ft.

As diamond drilling and later develop-

ment work showed the dip of the vein to be uniform and the ore shoots to be fairly persistent, prospecting is now done by sinking the shaft to a new level, crosscutting to the vein and drifting thereon.

Crosscutting is practiced extensively in both the extreme east and west areas to explore for parallel veins and splits of the known vein. Raises are driven where the outlines of ore bodies are unknown. Whenever possible the aim is to make preliminary prospecting serve for ore development and stoping.

METHODS OF SAMPLING AND ESTIMATION OF ORE BODIES

Grab samples are taken from all development faces in mineralized ground under the direction of the shift bosses. They are taken either by the muckers from the pile at the face, or by the "grizzly man" at the shaft station. Stope samples also are taken by the latter from each car as it is dumped into the pocket at the shaft.

In addition to the sampling mentioned, an engineer helper samples all development faces. If the ore encountered is marginal in value, it is sampled by cutting channels across the back of the drift or raise with moil and hammer at 5-ft. intervals. If the ore is high grade, the channels are spaced at 10-ft. intervals. The engineer helper also takes 50-pound grab samples of the muck pile whenever possible. Stope faces are sampled only when the values are marginal or to determine grades for the yearly ore estimate. Mine samples are generally 10 to 15 percent higher than the smelter samples.

All assay returns are recorded on assay sheets. The returns from all faces are plotted on a longitudinal section as-say map.

An ore reserve estimate is computed yearly. As the stopes are generally at 100-ft. intervals, the estimate is based on 100-ft. blocks. The estimate includes two classes of ore—actual ore and probable ore. When the ore has been cut on two consecutive levels and the probable shape of the ore body has been outlined, the ore between the levels is all classed as actual ore. If the ore has been developed by a drift on one level only, the actual-ore outline is drawn 25 ft. below the drift, 35 ft. beyond the face, and 35 ft. above the drift (or the proved height if raising or stoping has been done).

When a drift on the bottom level, or any drift that extends beyond other workings, is in ore, an additional 25 ft. is classed as probable ore, below, beyond, and above the drift. Where levels are 250 to 300 ft. apart and each level is in ore, a similar estimate of probable ore in addition to actual ore is made. Probable ore estimates resulting from the application of these rules are often re-

duced, because of the erratic nature of the ore bodies in certain sections of the mine, especially in the east side or where the walls are andesite.

In calculating the grade of ore reserves, proper deductions are made for differences between mine and smelter assays and for dilution. A factor of 14 cu. ft. per ton of ore in place and 20 cu. ft. of broken ore per ton is used in calculating tonnages. The former is high enough to allow for sorting and for the occasional horses of waste encountered in stoping.

The amount of broken ore in shrinkage stopes is estimated monthly.

DEVELOPMENT

General Plan

The Emerald vein is developed from the zero level or haulage adit. The distance from the portal, where the power plant and other surface equipment are located, to the Emerald shaft is 865 ft.

The Emerald is a three-compartment vertical shaft. It is collared in the vein at the zero level, 300 ft. below the outcrop. From there it extends to a depth of 1,732 ft. below the adit level, the dip of the vein soon placing it 100 ft. or more in the footwall (see Figure 2).

When the Calumet and Arizona Co. acquired the mine, levels had been run at 100, 200, 300, 450, 550, and 750 ft. below the zero level. Connections had also been made to the Superior shaft to the west, the Upper and Lower Dundee shafts to the east, and the Old 85 shaft to the north. All these shafts, although open for ventilation purposes, are now inaccessible to travel.

From the 750 level, which is about the top of the present active zone, down to the 1,650 level, the mine is developed by levels spaced 150 ft. apart vertically.

The Jim Crow shaft was recently sunk 2,360 ft. west of the Emerald shaft in the footwall of the vein (see Figure 4). The Jim Crow is a three-compartment shaft of the same dimensions as the Emerald shaft. It connects at present with the 200, 450, 650, 900, 1,050, and 1,350 levels. It has been sunk to the 1,650 level, however, and will be connected with the 1,500 and 1,650 levels in the near future. This shaft was sunk for ventilation, emergency exit, and as a base from which to prospect the west-ern area of the mine.

The general plan of development of any one level is as follows: The Emerald shaft is sunk about 10 ft. below the rail elevation of the new level, and a shaft station is excavated equal in width to the length of the shaft and 15 ft. in length and height. Shaft bearers are placed in position followed by shaft timbering and several station sets. Then shaft sinking and additional station excavation are resumed. A crosscut is driven to the vein

and drifts started in both directions along the vein. Raises are driven to the level above at about 500-ft. intervals until the limits of the ore bodies are reached. These raises are used for ventilation and emergency exits.

Drilling and Blasting

Drilling and blasting practices are regulated by the mine foreman and shift bosses. A Leyner-type drifter weighing 118 pounds is used in all drifting. Drill columns and crossarms $3\frac{1}{2}$ in. in diameter are used. A crossbar is used only when drilling is done on two or three shifts per day. A 60-pound jackhammer is used for shaft sinking, slabbing, and drilling boulders in stopes. Hand-rotated stopers are used in stoping and raising operations. Line oilers are standard equipment. The air pressure at the working face is 80 pounds per square inch.

One-in. hollow round steel is used in all Leyners and jackhammers, and 1-in. cruciform steel with stopers. Bits are of the cross type, with double tapers of 5 and 14°. The gage of starter bits is 2 in. for both types of steel with a reduction of $\frac{1}{8}$ in. for each succeeding steel. Starters are 24 in. long; the change in length is 12 in.

Forty percent strength gelatin dynamite, No. 8 caps and waterproof fuse are used in all blasting in drifts, raises, and stopes. Electric blasting is practiced in shaft-sinking operations.

Drifts

Drifts are generally 5 by 7 ft. in cross section, although if the vein is 6 or $6\frac{1}{2}$ ft. wide the drift is run that width. If the vein width is greater than $6\frac{1}{2}$ ft., the drift is run on the footwall. Often the higher-grade ore is along the footwall and the stope chutes are spaced along the footwall. Prospect crosscuts are 4 by 6 ft. in cross section. A standard V-cut round is used. The number of holes in drift rounds ranges from 13 to 22, depending on the hardness of the vein material. Timbering is rarely necessary as the ground is very firm. All mucking is done by hand.

Raises

Raises are driven on the vein between the levels for prospecting, developing, stoping, and ventilation. Raises are of three classes, depending on the use to which the raise is to be put and the nature of the ground.

(1) Stull raises with two compartments, a manway, and a lined chute (Figure 5). The cross section of this type of raise is 5 by 8 ft. However, if the vein is from 5 to 7 ft. wide, the raise is driven the width of the vein. If the vein is more than 7 ft. wide, the raise is driven along the hanging wall in order to hitch the stulls more securely into the

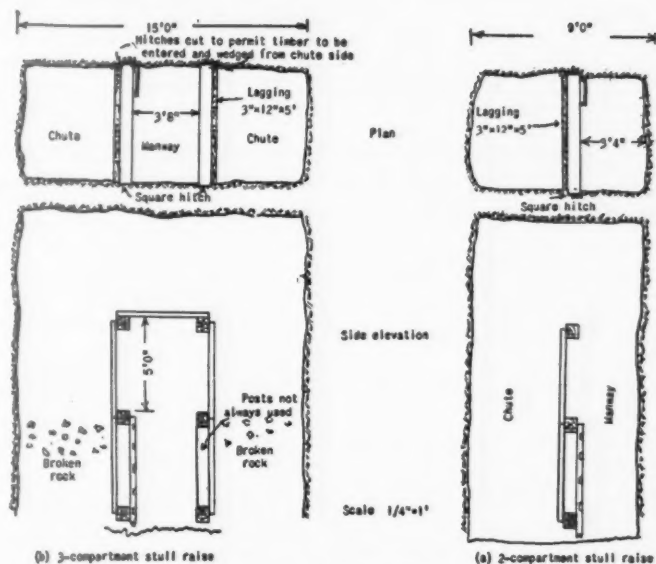


Figure 5. Stalled raises

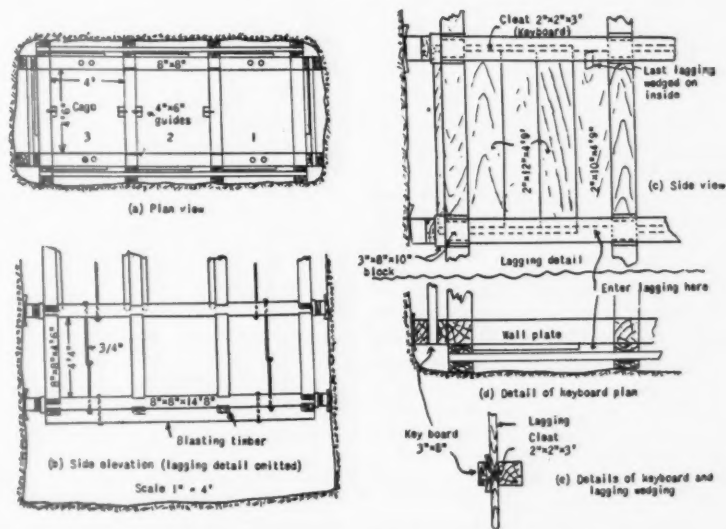


Figure 6. Arrangement of timbering and keyboard lagging, Jim Crow shaft

wall. The hanging wall generally carries some gouge, and ore left on the hanging wall will slough off more readily than ore left on the footwall. The manway can later be used in stoping operations by installing a timber slide and an air line. This type of raise is used for prospecting, ventilation, and in developing shrinkage stopes.

(2) Stull, three-compartment raises, with a manway and two-lined chutes (see Figure 5b). This type of raise is used for ore and waste transfer and for developing cut-and-fill stopes.

(3) Cribbed, two-compartment raises. The cross-section of the chute compartment is 4 ft. 2 in. square, and that of the manway 4 ft. 2 in. by 2 ft. 6 in. The cribbing is generally of 2-in. timber. This type of raise is used in bad ground.

Shaft Sinking

The two main shafts, the Emerald and the Jim Crow, have three compartments, two for the skips and cage and a manway and pipe compartment. All compartments are identical in cross section, 4 ft. by 4½ ft. inside the timbers (see Figures 6 and 7).

As sinking methods are the same at both shafts, the operations just completed (September 8, 1930) at the Jim Crow shaft will be described.

The Jim Crow shaft, with a rock section of $7\frac{1}{4}$ by $16\frac{1}{2}$, was sunk from the surface (elevation 4,780 ft. or 87 ft. above the collar of the Emerald) to a depth of 1,742 ft., 26 ft. below the 1,650 level through andesite and diorite.

The sinking crew on each of three consecutive eight-hour shifts consisted of one

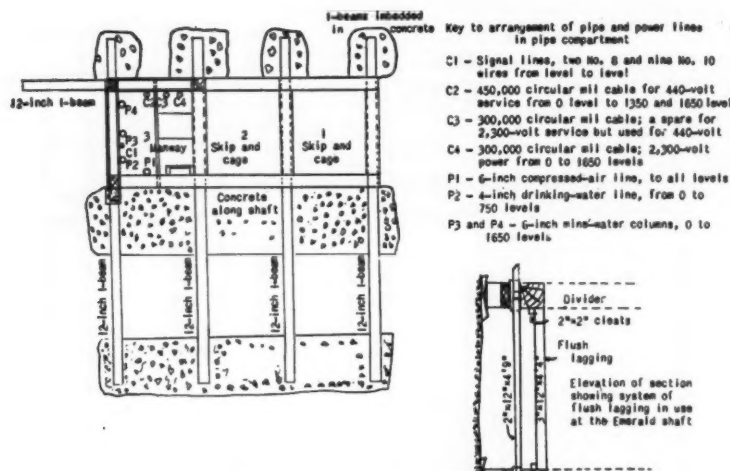


Figure 7. Plan of collar of Emerald shaft

jigger boss and three miners (all at the bottom of the shaft), one topman, and one hoisting engineer. One shift boss had charge of the entire crew, which consisted of a total of 18 men per 24 hours. Mexican labor was used in the shaft. The shaft sinking was done on contract.

The time cycle of operations at the 1,650 level for a 5-ft. round, which broke about 70 buckets of rock, was as follows: One hour setting up equipment, 6 hours drilling, 1 hour removing equipment and loading, 1 hour waiting for smoke to clear out, 12 hours mucking and picking bottom, 5 hours timbering.

When drilling operations were started a manifold with six air connections, four for jackhammers and two for blow pipes, was lowered through No. 1, or the manway compartment. When the drilling was finished, the manifold was hoisted above the bulkhead in the same compartment. Steel and supplies were handled in a bucket suspended under a crosshead in No. 2 compartment.

A standard V-cut shaft round, consisting of 26 or 36 holes, was drilled with 58-pound jackhammer (Figure 8). The andesite is good drilling ground, except when silicified near the contacts. The diorite, although very hard, is fair drilling but tough breaking ground. Very little heavy or loose ground was encountered. The cut holes were loaded with 5 to 7 1/4 by 8-in. cartridges of 60 percent strength gelatin dynamite, and the other holes with 4 to 6 sticks of 40 percent gelatin. No. 8 electric detonators in 1 to 10 delays, connected to a 110-volt light circuit, were used for firing the rounds.

The broken rock was shoveled into two 15 1/2 cu. ft. buckets, which were hoisted in the No. 2 compartment. One bucket was being loaded while the second bucket was being dumped. Above the 900 level all spoil was hoisted to the surface; below this level it was hoisted to a pocket above the 900-shaft station. The broken rock

at the 900 level was used for filling stopes. At the 900 and at the surface the buckets were dumped by means of a slide door and tail chain, operated by the topman. About 65 buckets were hoisted per shift. From below the 1,650 level, where the hoisting speed of the buckets was 450 ft. per minute, the hoisting of the rock was the determining factor in the speed of the mucking operations.

Timber precedes mucking, so that the men can work on top of the muck pile. The timbers are lowered under the bottom of a cage or crosshead in No. 3 compartment.

Shaft timbers are 8 by 8-in. rough Oregon fir. Shaft sets are on 5-ft. centers. Shaft timbers with keyboards and lagging cleats attached are lowered through No. 3 cage compartment. A blasting set (Figure 6b) is used to protect the shaft timbers during blasting. This blasting set is worn out or broken in about six blasting operations. "Keyboard" blocking (Figures 6c, d, and e) is always used. The keyboard is 3 by 8-in. timber. When caving ground is encountered 8 by 8-in. timbers are used for additional "bridge" blocking. Some advantages of keyboard blocking over stull blocking are:

1. On blasting, keyboard blocking is rarely knocked out or loosened.

2. A set can be blocked faster and more securely.

3. When a formerly wet shaft becomes dry, keyboard blocking does not loosen and fall out.

4. The lagging is more secure.

The three compartments are "outside" lagged with 2 by 12-in. by 4 ft. 10-in. planks. Lagging is placed behind the set as shown in Figure 6, pushed over on the cleat, and wedged at the top and bottom by wedges placed between the lagging and the keyboard. The last lagging placed is wedged on the inside instead of the outside. Thus all lagging is so

secured that it can not possibly become loosened and fall into the shaft compartments.

In the Emerald shaft all compartments are similarly outside-lagged. But, in addition, the two hoisting compartments are also inside-lagged, as shown by Figure 7. Prior to the use of inside lagging, the timbers of the shaft sets were badly worn and the lagging was knocked out by falling rock during hoisting operations.

Bearers are placed at intervals of 150 ft.

As the rock temperature below the 1,350 level is rather high, an electric blower on the 1,050 station of the Jim Crow forces air through a 12-in. metal pipe to the bottom of the shaft. The temperature at the bottom is still 87° F., and the relative humidity is 100 percent.

When sinking in the Emerald shaft is resumed, a small electric sinking hoist will be installed on the lowest working level, the 1,650. As No. 3 compartment (see Figure 7) is full of pipes and cables leading to the pumps, hoisting will be done through No. 1 compartment. A bulkhead will be put in No. 1 compartment above the top of the station and an idler sheave hung so that the cable will not hit the station timber. Muck will be hoisted in buckets and dumped by means of a slide and tail chain into the 1,650 pocket, from which it will be hoisted to the surface by means of the skip in No. 2 compartment. If the muck is needed for waste fill in the mine, it will be dumped from the bucket into cars at the 1,650 level and hoisted in the cages to other levels of the mine.

The following table shows detailed cost figures for sinking the Jim Crow shaft:

COST OF SINKING THE JIM CROW SHAFT		
Footage to date: 1,720 feet		
	Amount	Cost per foot
Labor and bonus.....	\$59,422.13	34.55
Shift boss, \$193.47 per month.		
Jiggers, \$5.00 per shift.		
Shaftmen, \$4.40 per shift.		
Top landers, \$3.30 per shift.		
Hoistmen, \$5.50 per shift.		
Air drills	6,068.22	3.53
Explosives	4,883.22	2.84
Framed timber	14,709.14	8.55
Miscellaneous supplies	6,506.17	3.78
Truck expense*	1,589.51	.92
Power expense	4,214.56	2.45
	\$97,392.95	\$56.62

* All supplies, drinking water, etc., handled by truck.

MINING METHODS

Early Mining Methods

Prior to 1913, when the Warner Brothers acquired the Eighty-Five mines, some square-setting was done in the upper oxidized zone, but the majority of the stoping was done by shrinkage and cut-and-fill. Some of the shrink-

age stopes can still be seen from the surface around the old Superior shaft. A few stulls have kept the walls from caving, even though the stopes were mined 30 years ago.

From 1913 to 1920 most of the ore was stoped by an overhand cut-and-back fill method. In this method a portion of the loose hanging wall was first shot down and the waste spread and smoothed horizontally. Flooring was then laid on top of the waste and the ore shot down upon it and mucked into cribbed chutes carried through the waste filling at 25-ft. intervals. Shrinkage stopes were tried very rarely. The cut-and-fill method described above required leaving 5 to 15-ft. pillars under the levels. At that time it was thought the pillars would be recovered, but caving of the levels occurred and very few of the pillars under the levels were ever recovered.

When the Calumet and Arizona acquired the mine in 1920, Ira B. Joralemon, who was the assistant general manager of the Bisbee mines, advised the use of the inclined cut-and-fill method; waste for filling was to be obtained from old filled stopes above. This method produces a cleaner ore and eliminates much handling of ore and waste filling in the stopes.

From 1920 to 1930 mining has been done by the following methods:

Shrinkage, 72 percent of the total.

Cut-and-fill, 28 percent of the total.

Square-set, only four square-set stopes in 11 years of mining.

Of the stopes mined by the cut-and-fill method, 64 percent were in the period 1920 to 1923. Shrinkage stoping gradually superseded the cut-and-fill method.

Present Mining Method

At present the two mining methods at the Eighty-Five mines are shrinkage and cut-and-fill.

The determining factors in the choice of mining methods at this mine are:

1. Character of the walls of the vein.
2. Quantity and mode of occurrence of country rock in the vein.
3. Grade of the section to be mined.
4. Requirement of a fixed monthly tonnage of a certain copper and silica content.

Shrinkage stoping is always employed where the walls are firm and if the vein is more than 3 ft. wide. Shrinkage stoping is also always used on marginal ore of high silica content, as lower costs are secured by the shrinkage method.

At present the inclined cut-and-fill method of mining is employed in some instances for the following reasons:

1. The walls may be weak owing either to: (a) The N. 65° E. to due east system of fractures closely paralleling either wall and forming planes of weakness, or (b) kaolinization of the walls.
2. The vein is wide, but (a) unmineral-

ized country rock occurs as a wide band within the enclosing walls, or (b) splits occur in the vein.

3. High-grade ore may occur in a narrow (2 or 3 ft.) vein.

4. To obtain a cleaner product.

At present all the ore is hand-sorted as it passes over a picking belt to the railroad cars. Although one shift of sorters can handle the present 7,000 tons of ore per month, this would be impossible if the 1929 schedule of 10,000 tons per month were in effect. However, in case of necessity, the ore coming from the 1,500 level cut-and-fill stopes could be run directly into the railroad cars without sorting.

Shrinkage Stoping

The method of stope development described in the following paragraphs is that used on the 1,350 level, where all the stopes are shrinkage stopes, four of the 20 being active at present.

Ore was encountered in the west drift on the 1,350 level at a point 320 ft. west of the Emerald shaft (see *Figures 1 and 3*). As the ore body had already been outlined on the 1,200 level, a two-compartment stull raise (No. 320 raise west) was immediately started. Advance was quickly resumed in the west drift and by the time the drift had advanced 500 ft. through high-grade ore, 320 raise west had connected to the 1,200 level. For ventilation and emergency exit another raise was started near the face of the drift. This raise, 725 raise west, was so spaced as to be used in the later stope development.

As the ore on the 1,200 and 1,350 levels is high grade, it was undesirable to leave level pillars under the drifts, therefore the tramming drift was advanced in the footwall. This drift started at the beginning of the ore body and advanced in the footwall parallel to the vein and 25 ft. from it. It was connected with the main west drift at intervals and finally at a point beyond the limits of the last ore body. It is used for tramming and travel purposes. This drift on the 1,350 level is 1,700 ft. long.

The advancing type of shrinkage method is in use at the Eighty-Five mines; that is, stoping operations are started at the end of the ore body nearer the shaft and advanced toward the farther limits of the ore body. Stoping may be divided into three separate operations: Stope preparation or cutting-out, back-stoping, and drawing.

Drilling for the cutting-out rounds was started at the 320 raise. The back of the drift was drilled for some distance and blasted down on the tracks. Working on top of the muck pile the miners drilled a second line of holes and blasted. This second round broke the back to an elevation of 15 ft. above the rail of the drift. If the ore was wider

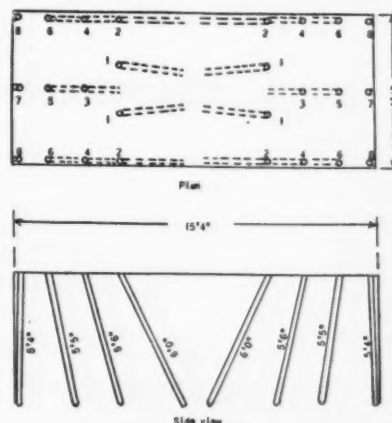


Figure 8. Standard shaft round. Numbers indicate order of firing and electric delay primers used

than the drift, it was slabbled off to full width at this time. This cutting-out operation now advanced along the drift and timbering was begun. Starting at 320 raise, 8 by 8-in. stulls were placed horizontally across the drift at 5-ft. intervals and at an elevation of 8 ft. above the track. For vein widths of 4 to 8 ft. no posts were used under the stulls other than the chute posts. For greater widths a second post may be used. Chutes were next built on the footwall side of the drift at 10-ft. intervals. Originally chutes were placed on 15-ft. centers, but it was found that where the ore was wet or selva occurred within the vein the ore tended to "chimney" between the chutes. Accordingly chutes are now spaced on 15-ft. centers only when the material blasted down in preparatory stoping is found to be marginal in value.

Sometimes pillars above the drift are employed in shrinkage stope mining, as shown in *Figures 9 and 10*. This may be done for either of two reasons: (1) The walls are weak and the vein is unusually wide. (2) The back of the drift is in waste or marginal material but development has shown ore to be in the block a little higher up.

Of all the shrinkage stopes mined during Calumet and Arizona ownership 15 percent have employed the chute-raise and pillar method between the back of the drift and the bottom of the stope. Of the pillars thus left above the drifts 60 percent were in waste or marginal material and 40 percent in ore. Of the 40 percent in ore, 20 percent have already been mined, 50 percent are still recoverable, and 30 percent are inaccessible.

Back-stoping (advancing the back upward) is next started. Drilling is done with hand-rotated stopers by a crew of one to four miners. Blasting must be light until the drift timbers are well covered with broken ore. The back of

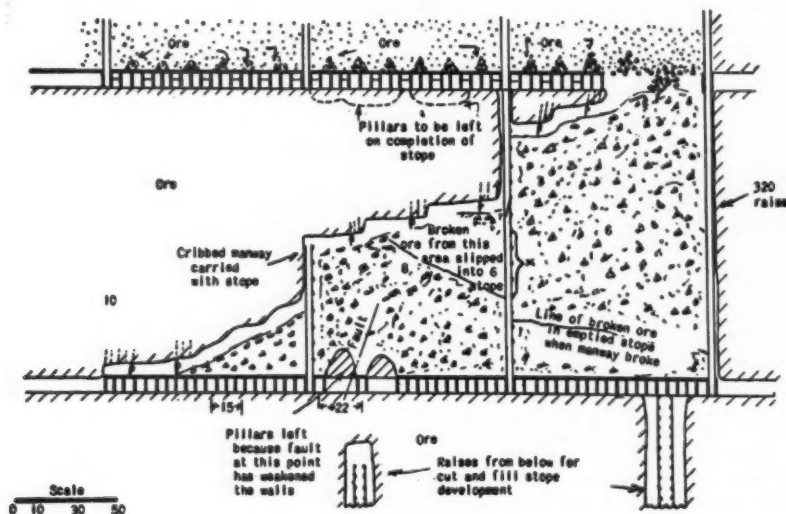


Figure 9. Shrinkage stope

the stope is carried slightly inclined toward the raise or manway that is holed to the level above (320 raise, Figure 9). The angle of the back ranges from 10° to 15° from the horizontal. This assists ventilation and somewhat aids the handling of drills and steel, which are usually brought in from above and taken out to the level below. When the stope can be entered from above at both ends, the back is carried horizontally.

At 100-ft. intervals a cribbed manway 2 ft. 6 in. by 2 ft. 6 in. in the clear is carried up with the stope. This manway is protected on the stope side by stulls set in hitches in the walls at 5-ft. intervals (see Figure 9). In narrow veins stulls can be spaced 8 or 10 ft. apart. Air lines enter the stope through the manways at both ends of the stope.

As the stope approaches the level above, it may be necessary to leave a 5 to 15-ft. pillar below that level. In this case a connection is made in the middle of the stope to the level above, to facilitate the handling of development waste later (Figure 9, Stope 8).

If, as is true on the 1,200 and 1,350 levels, a footwall drift has been driven, no necessity for leaving pillars exists, and the vein is mined out entirely to the level (see Figure 9, Stope 6). As the stope above the 1,200 level was in high-grade ore, the timbering between the chutes of the worked-out stope is shot out at this time, and the pile of broken ore remaining between the chutes is dropped into the now completed stope below. If pillars of ore were left between the chutes of the stopes above they are now blasted down, as shown in Figure 10.

When the shrinkage stopes are drawn the hanging wall, no longer having any support, begins to slough off. Consequently, by the time the stope is nearly drawn empty, considerable waste has al-

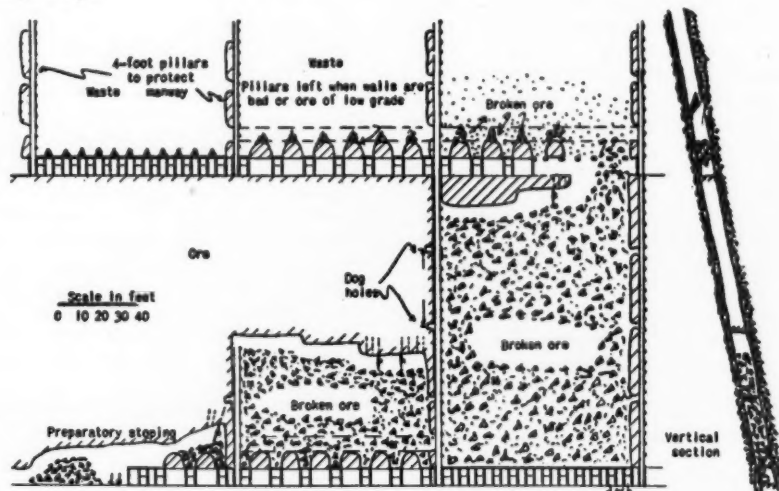


Figure 10. Shrinkage stope

ready fallen on top of the broken ore. Therefore, care must be taken that the stopes are drawn down level.

As stated before, the ore breaks rather fine, and if it becomes wet or mixed with the soft material from the walls it will "chimney" between the chutes. These chimneys of broken ore stand almost vertically to heights of 10 to 30 ft. above the bottom of the stope. If the ore is high grade and no floor pillar is to be left under the level, as was the case on the 1,200 and 1,350 levels, this broken, chimneyed ore is partly recovered by the following method:

In the cut-and-fill method of mining, when ore from upper stopes is recovered as above described, a close check on grade and tonnage can be made. It has been found that the first runs of broken ore from above will, even after dilution, average above 2.5 and often over 3 percent.

The costs of a shrinkage stope worked by the method just described are shown in Table 1.

It is best in shrinkage stoping to have three or four adjacent stopes in successive stages of operation. When back-stoping is finished in one stope, the broken ore should not be drawn out until the

TABLE 1.—SHRINKAGE STOPE COSTS, 1,350 LEVEL, YEAR 1925
(Costs per ton, direct charges only)

	Labor		Explosives	Timber	Other supplies	Air drills	Total cost per ton
	Bonus	Inc. bonus					
8 stope	\$0.04	\$0.59	\$0.23	\$0.14	\$0.02	\$0.39	\$1.37
6 stope .....	.02	.75	.27	.20	.02	.46	1.70

Note: The average width of 6 stope was 4 ft.; of 8 stope, 8.5 ft. Lower costs were obtained in the wider stopes.

next stope in line is completed. If the stope is drawn too soon the weight of the broken ore in the operating stope is liable to push the manway over into the partly drawn stope. An example of this is shown in *Figure 9*.

During 1928 and 1929 development work on the 1,350 west drift was delayed. Repair work in the operating shaft during these years also reduced total mining shifts. But the tonnage demands were greater than ever. Consequently the stopes were drawn of their ore too quickly.

As a result of the above conditions a modification of the shrinkage system previously employed was introduced into the last eight shrinkage stopes of the 1,350 level.

As a stope is mined upwards, a "dog-hole" drift 5 ft. long is driven in the vein and toward the next stope from the manway of the operating stope at a height of 35 or 40 ft. above the rail.

into the next dog-hole. This is especially disadvantageous when the stope is holing into the second and third dog-holes because the only entrance is now from below. Ventilation is also restricted.

2. About 4 percent of the stope to be mined is left as pillars which rarely will be recovered.

The above method has recently been modified by reducing the thickness of the pillar from 5 to 2 ft. A pillar this size is naturally somewhat shattered and will spall off when the two stopes are drawn.

As the length of dog-hole is shortened to 2 ft., the short drift need not be driven from the manway side. In stopping upward, when the dog-hole position is reached, the miner now drills with a stoper about six inclined holes from the stope. Upon blasting, this round "bells" the ground away from the manway about 2.5 ft. Thus half of a shift of stoper

drilling suffices where formerly two jackhammer rounds were necessary.

PERCENT EXTRACTION

As shrinkage stoping is practiced on the 1,350 and 1,500 level, no pillars are used except in the modified method employed in certain 1,350-level stopes. As the conditions necessitating the modified method no longer exist, the new shrinkage stopes are being opened as shown in *Figure 9*. Thus 100 percent of ore in place is extracted. Also the percentage of recovery of the broken ore that has piled up between the chutes is high. There is considerable dilution of the ore by waste spalling from the walls. In addition, as the levels above have been caved, some waste gets mixed with the ore in the final drawing period. All the ore hoisted at present is passed over a picking belt and hand-sorted. From 15 to 18 percent of the material hoisted is thus rejected.

Transportation, sorting, and loading cost is 20 cents per ton of ore shipped. This cost includes hauling the ore by motor from the ore pocket at the collar of the shaft to the ore bin, sorting, and loading into railroad cars.

INCLINED CUT AND FILL

The inclined cut-and-fill method, as now practiced at the Eighty-five mines, was introduced by A. J. Balmforth, mine superintendent, several years ago.

The method has been employed to date on six stopes, five of which are over the 1,500-level west drift (see *Figure 1*).

A two-compartment stull raise (*Figure 5 b*) was started at the near limit of the ore body. Subsequently six more raises were started at intervals of 140 ft. When the first two raises were holed through to the 1,350 level, the remainder were started successively. Meanwhile, sublevel drifts were driven toward each other at an elevation of 20 ft. above the

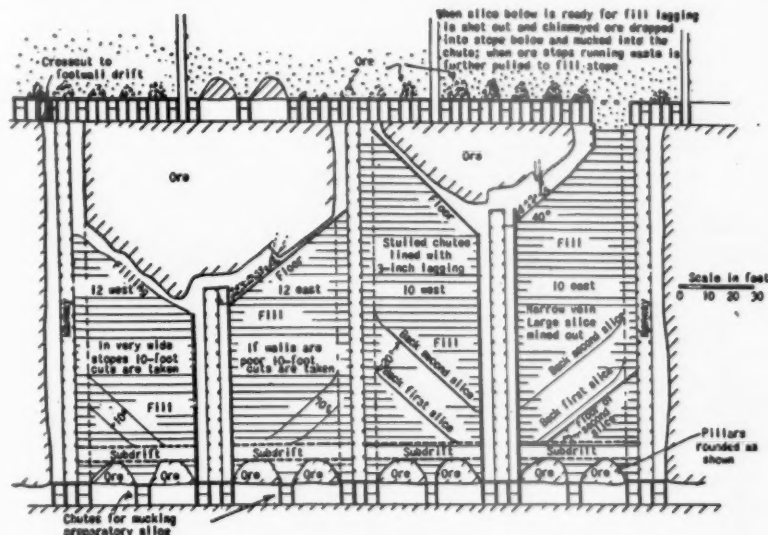


Figure 11. Detail of cut and fill stopes

A jackhammer is used in this operation. Successive dog-holes are driven at 35-ft. vertical intervals as the stope is advanced to completion (see *Figure 10*, Stopes 28 and 30).

When the following stope is started a 5-ft. pillar of ore is left between the manway of the recently completed stope and the new stope. As shown in 28 stope on *Figure 10*, the stope is mined inclined until the first dog-hole is reached. Then the angle of attack is reversed, and the other end of the stope is advanced and a new dog-hole driven. This is repeated, as shown in *Figure 10*, until the stope is completed. The advantage of this method is that the manway is protected even if the last completed stope has been drawn empty. Disadvantages are:

1. The closing off of the manway from above while advancing upward to hole

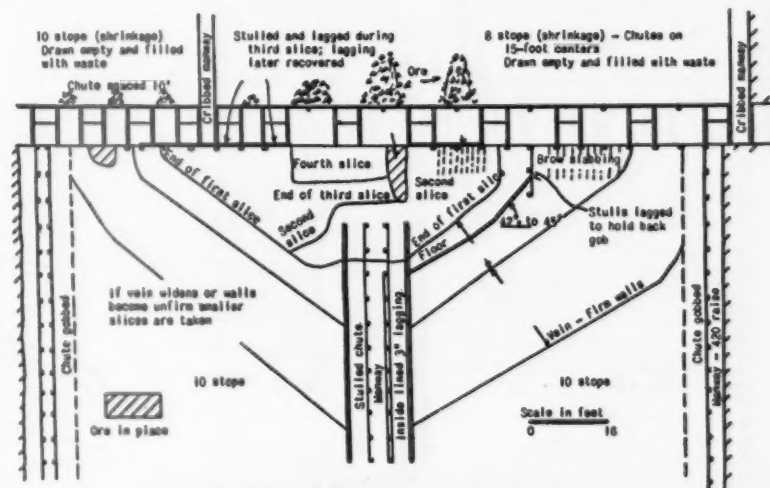


Figure 12. Longitudinal section of cut-and-fill stope

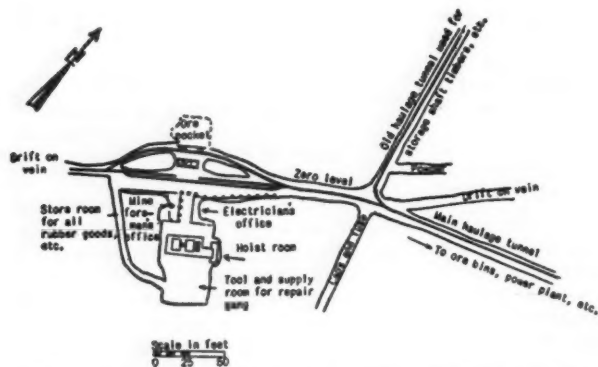


Figure 13. Plan of zero level at collar of Emerald shaft

rail to connect the first two raises (see Figure 11). Midway between the raises a three-compartment stull raise was driven to an elevation of 26 ft. In the middle of each of the two remaining floor pillars of the stope, untimbered raises were driven to a height of 26 ft. and were discontinued. The latter two raises are driven to reduce the shoveling on the sill floor of the stope and are filled with waste and abandoned after the first slice is finished. After the subdrifts have connected they are silled out to the full width of the ore, care being exercised that both walls are exposed. Two successive 5-ft. inclined cuts are next mined out in both ends of the stope. If the walls are firm the miners, working on the

floored over before filling the stope. Waste is now drawn from stopes above and also secured from development work through the two fill raises until it is within 2 or 3 ft. of the back. As the angle of repose of the fill is about 39° , the back of the stope is mined at that angle. If the fill contains large boulders, development waste is added before flooring. The more finely broken waste protects the flooring from excessive breakage.

On completion of the fill 2 by 10-in. sills are laid flush with the fill, and 2 by 10-in. by 10 or 12-ft. flooring is nailed to these. At the high end the flooring is given a slightly steeper angle to make the ore run more freely.

broken ore, mine one or two additional 5-ft. cuts. The back of the stope now has the shape indicated as "end of first slice," Figure 9. After the back has been thoroughly barred down, the chutes are pulled and the remaining broken ore is mucked out. If the sill pillars are high-grade ore, they are

Before mining operations are started grizzlies of 8 by 8-in. timber spaced 10 in. apart are placed over each chute. Ninety-pound rails are sometimes used instead of timber. Occasionally on the first few slices, when the ore breaks fine, grizzlies are not necessary. Almost no secondary blasting is necessary in cut-and-fill stopes.

Mining is resumed upon the completion of flooring. The cycle of operations is the same for each cut. While one slice is being filled, that on the other end of the stope is being mined. A uniform tonnage of ore is thus maintained. Before each filling, the manway and two chutes are raised.

When the stope approaches the level above, both slices are mined so that the top of each just reaches the level. In two or three cuts one side of the stope is completed, the direction of retreat being toward the ore chute (see Figure 12). Both overhand mining and brow slabbing are practiced in this operation. The slice is completed when the brow approaches a point directly over the ore chute. The slice is then filled.

As the final slice, when completed, is a rather large one, the hanging wall may slough or the timbers of the old stope overhead may suddenly drop. The floor is therefore given a steep angle (45°) so that the ore will run directly into the chute. Thus mucking is eliminated. The miners are safe on the level above, as

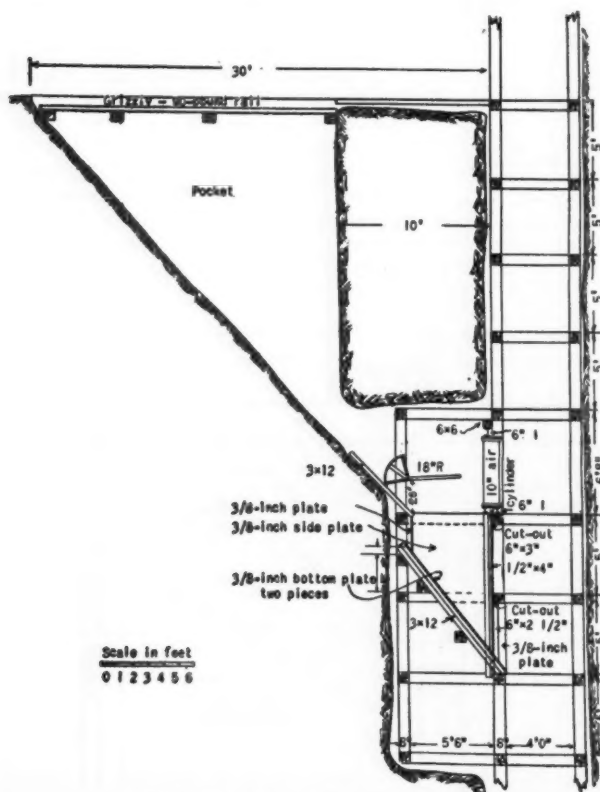


Figure 14. Side elevation of pocket

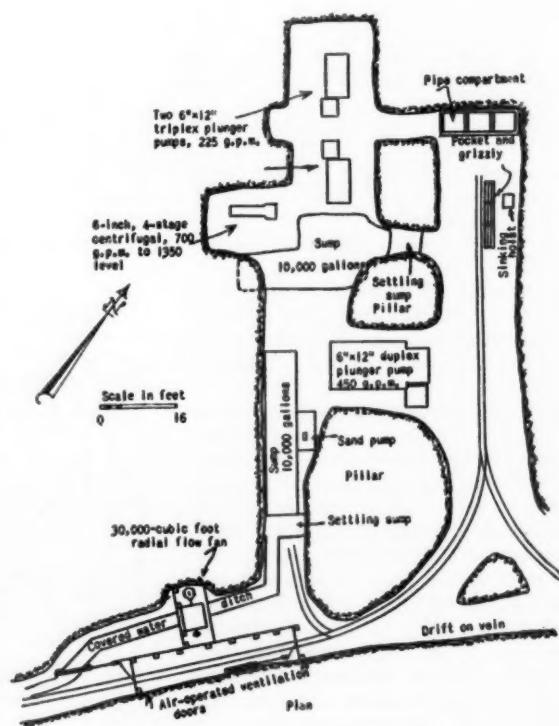


Figure 15. Pump and fan station of 1,650-foot level

most of the pillar is brow-slabb'd. In this last slice no grizzly is used over the chute, the ore being pulled only as is necessary until the entire slice is completed, when all the broken ore is drawn. It is after this operation that, as in shrinkage stoping, the broken ore remaining in the stope overhead is partly recovered.

The opposite side of the stope is now mined similarly, the direction of retreat being toward the ore chute. The bottom of the level on this side, however, is studded with 8 by 8-in. timber and lagged to protect the men below. To date one stope has been completed as described. The walls were firmer than anticipated, and the final pillar left over the ore chute was only 3 ft. wide and 14 ft. high (deep). The walls stand better than expected because the vein is narrow (5 ft.) and because all the mined-out stops above are completely filled with waste.

During the completion of 10 stopes, 300 tons of high-grade ore was recovered from the old stope above. The lagging between the chutes was shot out and the piles of broken ore were recovered.

When the vein is narrow and the walls firm, the height of a cut is increased. Thus shrinkage practice is approximated during part of the mining operation. This method has been referred to as semi-shrinkage.*

Hand-rotated stopers are used in over-hand slicing, and pluggers in brow-slabbings and plugging boulders.

The cut-and-fill method is superior to shrinkage stoping in that a cleaner product is obtained. All ore broken in the stopes is recovered. Almost 100 percent of the ore in floor pillars is recovered.

The disadvantages of the method are the greater amount of development work necessary, and the longer time required to bring the stope into production.

UNDERGROUND TRANSPORTATION

All ore is hand-trammed in 16-cu.-ft., 1-ton, roller-bearing, end-dump cars. The average tramping distance of ore is 1,200 ft. The track grade is one-half of 1 percent in favor of the load. Track gauge is 18 in.; 16-pound rails are used.

Each shaft station has an ore pocket. Ninety-pound rails spaced 10 in. apart form a grizzly over the pocket.

HOISTING

The Emerald shaft is equipped with a geared electric hoist installed in an underground hoist room on the adit level (Figure 13). The rope load capacity is 8 tons; rope speed is 1,000 ft. per minute. The man cage holds nine men, and is suspended under the skip. Ore is hoisted in balance in 3-ton skips from

* See description in Lavender, H. M., Mining Methods at the Campbell Mine of the Calumet and Arizona Mining Co., Warren, Ariz., Information Circular 6289, Bureau of Mines, 1930, 18 pp.

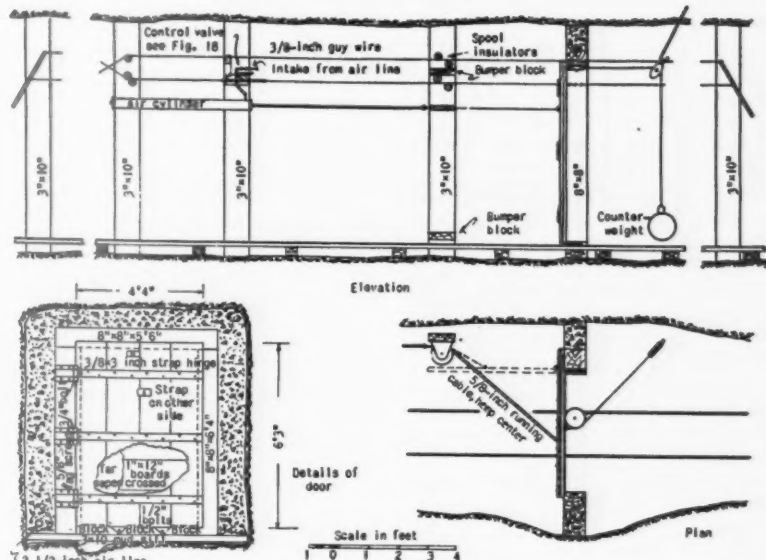


Figure 16. Air-operated ventilation doors

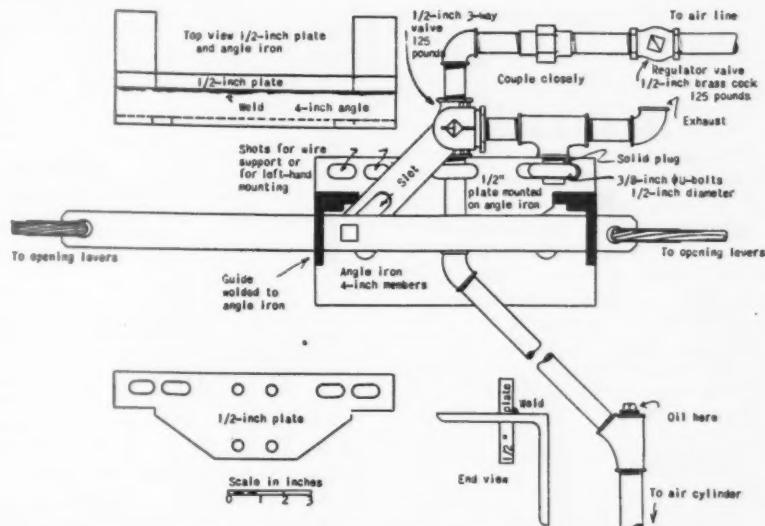


Figure 17. Control valve assembly for air-operated ventilation doors

the various pockets, all of which are equipped with air-controlled skip hoppers holding 3 tons of ore (*Figure 14*). Ore is handled on the adit level by a 3-ton gasoline-driven locomotive, pulling five 2½-ton V-bottomed side-dump cars.

PUMPING

Pumping is an operation of major importance, a total of 450 gallons a minute being pumped to the surface. The cost of this is 46 cents per ton of ore shipped.

A 5 by 12-in. triplex pump, with a capacity of 120 gallons per minute, pumps 50 gallons per minute from the 750 level to the surface. This supplies drinking water to the townsite of Valedon and boiler feed water to the power plant.

Four hundred and fifty gallons per minute is pumped from the 1,650 level to

the surface (see *Figure 15*). Three units can each handle this flow independently. They are (a) two 6 by 12-in. triplex pumps, with a capacity of 450 gallons per minute against a head of 2,200 ft., which are driven by a 200-hp., 440-volt induction motor; (b) one duplex, 6 by 18-in. pump, with a capacity of 440 gallons per minute against a head of 2,200 ft., driven by a 250-hp., 2,200-volt induction motor; (c) one 6-in. centrifugal pump having a capacity of 700 gallons per minute against a head of 700 ft. This centrifugal pumps the 1,650-level water to the 1,350-level sump. At the 1,350 are two tandem, 6-in. centrifugals with a capacity of 700 gallons per minute against a head of 1,400 ft.; these are driven by a 250-hp., 440-volt induction motor, and lift the water to the surface.

All water coming from above the 1,350 level can be diverted to the sump there and lifted to the surface by one triplex 5 by 12-in. pump having a capacity of 120 gallons per minute against a head of 1,600 ft. This pump is driven by a 100-hp., 440-volt induction motor.

Two extra pumps in first-class condition are in reserve. One is a deep-well turbine pump, 6-stage, capacity 1,400 gallons per minute against a head of 336 ft.; driven by a 200-hp., 440-volt induction motor. The other is a 6-in. centrifugal, capacity 700 gallons per minute against a head of 700 ft.; driven by a 250-hp., 440-volt induction motor.

The temperature of the water at the 1,650 level face is 104° F. The water is not acid.

For fire protection a 10,000-gallon tank on the hillside back of camp is kept full of water.

VENTILATION

Until mining operations reached the 1,350 level, a fairly satisfactory natural ventilation system existed. On the east side of the mine the Lower Dundee shaft was strongly downcast; on the west side an air shaft, the Superior shaft, and numerous old openings strongly upcast. Development on the 1,500 and 1,650 levels was continued using natural ventilation. Although natural ventilation removed the smoke and gas from the mine, the heat and humidity on the bottom levels were oppressive. While developing the 1,650 level, west drift, a flow of water with a temperature of 104° F. was encountered. This water, flowing to the 1,650 pump station, further increased the already high temperatures. Accordingly a system of mechanical ventilation was started. A 30,000-cu.-ft. capacity radial-

TABLE 2
TEMPERATURE AND HUMIDITY AT VARIOUS LOCATIONS IN THE EIGHTY-FIVE MINE

Level	Place	Temperature, °F.		Relative humidity, percent	Remarks
		Dry	Wet		
Zero	Near entrance	79	66	50	9 a. m. Sept. 10, weather cloudy and cool.
Zero	Shaft collar	72	69	86	
1,650	Jim Crow shaft station*	84	82	92	Compressed air line open, auxiliary blower running.
1,350	32 stope	84	84	100	
1,500	Face West drift	87½	87½	100	
1,650	Pump station	80	80	100	Temperature of water from 1,650 West drift, 92° F.
1,650	1,070 raise	86	86	100	Water temperature 100° F. in main air circuit.
1,650	50 ft. west of 1,070 raise	97	97	100	Just west of main air circuit
1,650	West drift at face	94	94	100	Water temperature, 103.5° F.

* Not yet connected to main 1,650 level and Emerald shaft.

TABLE 3
WAGE SCALE FOR THE PRINCIPAL UNDERGROUND LABOR CLASSIFICATIONS

Classification	Period				
	11-1-1923 to 9-30-1928 also 5-1-1930 to 6-1-1930	10-1-1928 to 1-31-1929	2-1-1929 to 2-28-1929	3-1-1929 to 3-31-1929	4-1-1929 to 5-1-1930
Miner, using Leyner	4.02	4.40	4.60	4.80	5.00
Miner, using stopper	3.80	3.65	3.80	3.95	4.10
Timberman	3.52	3.85	4.05	4.20	4.40
Mucker	2.86	3.15	3.30	3.45	3.60
Trammer	2.86	3.15	3.30	3.45	3.60
Ore sorter	2.64	2.90	3.05	3.15	3.30
Trackman	3.52	3.85	4.05	4.20	4.40
Pipeman	3.52	3.85	4.05	4.20	4.40
Pumpman	4.29	4.70	4.95	5.15	5.35
Hoist engineer—85 shaft	6.00	6.60	6.90	7.20	7.50
Shaft miner	4.40	4.85	5.05	5.30	5.50
Jigger boss	5.00	....	....	6.00	6.25

TABLE 4
COSTS

Working place	DEVELOPMENT COSTS, PER FOOT					
	Labor, including bonus	Explosives	Timber	Air drills	Other supplies	Footage
1,465 crosscut, 650 level	\$4.29	\$1.83	....	\$2.50	....	\$8.62
West drift, 1,650 level	5.98	2.38	....	2.75	....	11.11
1,780 raise, 750 level	8.60	2.97	\$0.82	5.05	\$0.11	17.55

Note: The following costs include direct charges only. The costs for 1,465 crosscut, 650 level, are representative. The material cut was hard andesite. The face was 1,000 feet off the main air course, and ventilation was by compressed air.

The 1,650-level West drift is in quartz and quartz-seamed monzonite. The face was 900 feet from main air current; two booster fans served for ventilation. A flow of 250 gallons of water per minute at 104° F. made working conditions at the face oppressive. The costs are therefore not representative of the average drift.

The 1,780 raise, 750 level was a two-compartment stull raise in quartz, driven from a sublevel.

TABLE 5—STOPE COSTS PER TON

Stope No.	Level	Type of stope	Year	Bonus	Labor, including bonus	Explosives	Timber	Air drills	Other supplies	Total	Tons
10	1,500	Cut-and-fill	1928, 1929, 1930...	\$0.00	\$1.26	\$0.28	\$0.20	\$0.60	\$0.03	\$2.37	7,034
26	1,050	Cut-and-fill	1929, 1930 .....	.02	1.62	.17	.27	.38	.02	2.46	4,956
26	1,350	Shrinkage, modified method using pillars.	1928, 1929 .....	.01	.72	.31	.07	.64	.01	1.75	7,332
3	900	Shrinkage, no pillars used.	1927 .....	.05	.49	.24	.10	.39	.01	1.23	4,973

NOTE: The costs of the 00 level, three stope, are low for the following reasons: (1) The stope is located on the main downcast air circuit. (2) The vein width averaged 7 ft.; the ore was leached, porous quartz. The above costs for three stopes are, however, representative of costs in oxidized ore bodies on the upper levels of the east side of the mine. Tonnage in above shrinkage stopes is wet tons drawn from stopes (before sorting).

August, 1930

ORE EXTRACTION EXPENSE

Accounts	Labor	Explosives	Timber	Other supplies	Power	Total	Wet tons mined: 7,220	
							Per wet ton	Per wet ton last month (7,074 tons)
Stopping	\$6,078.78	\$2,050.22	\$1,678.50	\$106.21	\$4,288.55	\$14,202.26	\$1.97	\$2.02
Maintenance	424.74	.....	287.53	1.92	.....	714.19	.10	.14
Tramming	4,261.82	.....	.....	601.15	.....	4,862.97	.67	.87
Engineering and assaying	628.26	.....	.....	173.28	.....	801.54	.11	.10
Station tending and ore pockets	584.98	.....	.....	38.10	.....	623.08	.09	.08
Underground tracks	989.79	.....	.....	79.45	.....	1,069.24	.14	.16
General underground	2,315.11	.....	.....	506.15	.....	2,821.26	.40	.44
Pumping	609.42	.....	.....	449.65	2,693.77	3,752.84	.52	.66
Hoisting	709.43	.....	.....	461.81	603.30	1,774.54	.24	.25
Sorting and loading ore	899.70	.....	.....	49.75	36.15	985.60	.14	.14
General surface	275.51	.....	.....	24.90	216.78	517.19	.07	.07
Ventilation	115.12	17.25	.....	150.00	21.34	303.71	.04	.02
Total	\$17,832.66	\$2,067.47	\$1,966.03	\$2,641.37	\$7,932.19	\$32,439.72	\$4.49	\$4.75
Cost per ton	2.47	0.28	0.27	0.37	1.10	4.49		
Wet tons per shift (day labor 4,989 shifts)							1.45	1.36

NOTE: The ore extraction expense shown above is fairly representative. The tramming cost includes tramming of ore and waste, chute blasting, and supplies such as mine cars, oil, etc. Over the past five years the development expense has averaged \$1 per ton. Transportation, treatment, general expense, taxes, and miscellaneous average a total of \$2.20 per ton.

TABLE 6—POWER COSTS, 1928 AND 1929

	1928 Total	Per kw.h.	1929 Total	Per kw.h.
Labor	\$1,306.67	\$0.00390	\$14,792.75	\$0.00260
Fuel oil and supplies	42,068.53	.01257	65,169.68	.01154
Depreciation	4,800.00	.00144	4,800.00	.00085
Six percent return on investment	7,200.00	.00215	7,200.00	.00130
Total cost	\$67,180.20	\$0.02006	\$91,962.43	\$0.01629

This cost includes labor (3 engineers, 3 firemen, and 1 chief engineer), fuel oil, depreciation at 4 percent on \$120,000, and 6 percent return on investment.

flow fan was installed on the 1,650 level (see Figure 15) and suitable doors were built to control the flow of air (Figures 16 and 17). The installation of the fan accelerated the downdraft in the Emerald shaft and the Lower Dundee and upcast to the other side of the mine to the new Jim Crow shaft. Temperatures have been reduced and working conditions improved by the increased velocity and volume of air. Conditions at the development faces of the 1,500 and 1,650 levels are still fairly oppressive; this condition will be remedied when connections are made with the Jim Crow shaft.

Auxiliary air and electrically driven booster fans serve the development faces off the main air courses. Chart (Table 2) shows the temperatures and percent saturation at several places in the mine.

WAGE, CONTRACT, AND BONUS SYSTEM

In Table 3 is the wage scale for the principal underground labor classifications.

All labor underground and all unskilled labor on surface is Mexican.

All development work is on a contract rate per foot of advance. Size of opening, class of ground, and working conditions control the variation in price per foot. In drifts and crosscuts the drilling and mucking contracts are separate. Trimming from stopes is on contract. A certain number of cars trammed per day is used as a standard and the trammers are paid 15 cents per car for every car over standard.

Stoping is contracted at a certain rate per yard. The so-called "yard" is a yard long, a yard high, and "vein width" wide. All contractors are guaranteed daily wages.

Shaft sinking is done on contract at a given rate per foot of advance. Only the men at the bottom participate in the bonus.

Standards are set by the chief engineer, subject to approval by the superintendent of the mine. Bonus is paid twice a month on measurements by the engineering department.

SAFETY WORK

Safety work is under the direction of the safety inspector of the parent company. He makes inspections and recommendations from time to time. The mine superintendent supervises conditions in the absence of the safety inspector.

First-aid instruction is given on the occasion of the visits of the Bureau of Mines instruction car.

First-aid equipment is maintained at the collar of the shaft.

All bosses receive a bonus for accident prevention, based on 1,000 shifts worked.

In Table 6 is shown power costs for the years 1928 and 1929.

Commission Recommends Transfer of Public Lands to States

Transfer of the mineral resources in the public domain to the states in which they are located for their use and administration under uniform federal and state legislation is recommended by the Commission on Administration and Conservation of the Public Domain, whose report to the President was made public in March. "The nation is committed to a policy of conservation of certain mineral resources," says the report. "The states are conscious of the importance of such conservation, but there is diversity of opinion regarding the wise use of those resources. Such a program must be based upon such uniformity of federal and state legislation and administration as will safeguard the principles of conservation. When such a program is developed and accepted by any state those resources should be transferred to the state. All portions of the unreserved and unappropriated public domain should be placed under responsible administration or regulation for the conservation and beneficial use of its resources. Areas valuable chiefly for the production of forage which can be conserved and administered by the states, should be granted to the states which will accept them by act of legislation. In the absence of legislation by any state within 10 years dealing with control and administration of the unreserved, unappropriated public domain, the President should establish, if authorized by Congress, a national range in such state, comprised of such public domain, including lands withdrawn for mineral or other purposes whose use for grazing is not inconsistent with the purpose of the withdrawal. In the case of lands classified as mineral in character, title to the state should be in fee simple, except for the reservation in the United States of specified minerals found by the Interior Department to be present in the land at the time of clear listing, and with res-

ervation in the United States, its permittees, lessees, or grantees, of the right to enter upon the lands, to prospect for, mine and remove such minerals."

Recommendation is made for appointment of a board of five members, two of whom shall be selected by the state and the other three by the President, and Secretaries of Interior and Agriculture, to act within one year on recommendations for additions to national forests, restoration to the public domain of areas now in national forests and consolidation of forest boundaries. Areas not included in the forests shall pass to the states.

The commission recommends that sale of lands by the states from these grants shall reserve the subsurface minerals. As to power plants on reclamation projects, the commission recommends that receipts from such hydroelectric development shall be used to repay the cost of the power plant and works, the cost of the reservoir and dam, and the balance go to the general reclamation fund. Appropriations are recommended to enable the General Land Office to survey the remaining unsurveyed areas.

Recommendation is also made that Congress authorize the President to consolidate and coordinate the executive and administrative bureaus, agencies and offices concerned with administration of laws relating to use and disposition of the public domain, and conservation of natural resources.

ALASKAN MINERAL SURVEYS

The most significant effort yet made to determine the mineral values of Alaska will be carried out this summer by the Department of the Interior.

The recent Congress appropriated \$250,000 "for continuation of the investigation of mineral and other resources of Alaska," along the Alaska Railroad. This is in addition to the regular appropriation for work in Alaska.

The appropriation was placed in the hands of Secretary Wilbur and he has organized the work chiefly through the Geological Survey. Though this special appropriation is not available until July 1, the Geological Survey, considering the short working season in Alaska, has arranged to make advances from its own funds that the work may be started early and a full season of results attained.

One of the major projects in this investigation will be an examination of the Anthracite Ridge coal field in the vicinity of the Alaska Railroad. This will include detailed surface investigations, including test pitting and trenching in the Anthracite Ridge coal field, where there are known veins more than 50 feet thick, subsurface core drilling and investigations in the Anthracite Ridge coal field, entailing about 4,000 feet of core drilling.

NEWS OF THE MINING FIELD

ZINC INSTITUTE ADOPTS GALVANIZING PLAN— ROOSEVELT REELECTED

The adoption of a plan to restore the demands for galvanized zinc products proved to be the feature of the thirteenth annual meeting of the American Zinc Institute, held at St. Louis, April 20 to 22. The plan includes the adoption of a standard brand sheet and an assessment upon mines and smelters of 12½ cents a ton on zinc concentrates and 25 cents a ton on slab zinc to provide a fund for an active campaign of education as to the value of using zinc-coated steel sheets for various uses.

Ralph M. Roosevelt, of New York City, vice president of the Eagle-Picher Lead Company, was reelected president of the institute for his third term by the new board of directors.

The three vice presidents, A. P. Cobb, of New York City, representing the eastern district; John A. Robinson, of Miami, representing the Middle West; and J. O. Elton, of Salt Lake City, were reelected, as were the treasurer, Howard I. Young, and secretary, J. D. Conover.

Eight new directors to serve a term of three years were elected. The new directors are A. E. Bendelari, Eagle-Picher Lead Company; J. A. Caselton, St. Louis Smelting and Refining Company; Frank Childress, Mid-Continent Lead and Zinc Company; A. P. Cobb, New Jersey Zinc Company; A. J. McKay, Matthiessen and Hegeler Zinc Company; C. T. Orr, Athletic Mining and Smelting Company; W. N. Smith, Century Zinc Company; E. H. Wolff, New Chicago Mines Corporation, and C. M. Chapin, Jr., St. Joseph Lead Company.

The opening session was presided over by Charles T. Orr, of Joplin, who was first president of the Zinc Institute, who introduced Associate City Counselor Wood, who, acting as substitute for Mayor Miller, delivered the address of welcome to St. Louis.

Acting President Orr spoke of St. Louis as the capital of the zinc industry and the place where the annual meetings of the institute should be held. He complimented the good work done by R. W. Roosevelt, president, and J. D. Conover, the secretary of the institute.

The afternoon session was devoted to the reports of committees covering im-

portant features of the year's progress. William Simon, of the American Metal Company, read the report of E. N. Zimmer on prime western zinc producers, showing what efforts were being made to increase the demands for zinc by securing the cooperation of the galvanizers.



R. M. Roosevelt

Dr. John A. Schaeffer, in behalf of the Lithopone Committee, told of the action necessary to meet the competition of the aluminum paint interests.

The report of the treasurer, Howard I. Young, showed that the institute, which a year ago had a deficit of \$8,000, now had a bank balance of more than \$7,000. President Roosevelt, in commenting on Treasurer Young's report, said that the officials of the organization had done everything in their power to reduce the expenses of the organization the past year in line with the reduced revenue.

President Roosevelt made a report covering general conditions of the Zinc Institute during the past year, showing how the organization had improved its influence and broadened its scope by securing aid from the galvanizers, smelters, lithopone manufacturers. He called upon several members of the press and

of different industries for their views on the zinc situation. An hour was given to a round-table discussion. Among the speakers was W. G. Stevens, of Miami, Okla., who recently made a tour of several Missouri counties to study the condition of galvanizing roofs, etc. He found the farmers and many hardware men unconcerned about the character or grade of the galvanizing used, none of them knowing what percent of zinc was used in the sheets they had purchased or how long it would protect their roofs. He recommended the Galvanizing Committee to require dealers to guarantee the quality of the sheets sold.

R. A. Langer, of the American Metal Market, suggested that all galvanizing be stamped at the factory and sold according to its grade.

Edward J. Mehren, of the McGraw-Hill Publishing Company, delivered an address on "A Platform for American Business," advocating a spirit of more optimism and offering many suggestions to industries in depression. He advocated the use of research work in promoting the zinc industry and the study of substitutions for zinc that were being used throughout the country in order that comparisons may be made and zinc's values shown.

The first day's activities were concluded by the annual smoker.

GALVANIZING PROGRAM PRESENTED

John A. Robinson, of the Commerce Mining and Royalty Company, of Miami, Okla., one of the vice presidents, took the chair during the morning session of April 21. He announced the important feature of the day to be galvanizing.

The galvanizing program, which President Roosevelt and other officials of the institute have been working on for two years, was outlined in a paper presented by Secretary Conover. Importance of the galvanizing program is best realized when it is known that 75 percent of the prime western metal goes into galvanized products and 45 percent of the total metal output seeks this means of consumption. Mr. Conover said:

"Something must be done not only to stimulate the consumption of zinc in the galvanizing industry but to hold the present business, which has suffered from inferior grade of galvanizing done, and which, in turn, has enabled other forms

of roofing material to obtain the business once enjoyed by the galvanizers," Mr. Conover declared.

PLAN STANDARD SHEET

The plan of the institute includes the adoption of a standard brand sheet, similar to the plan adopted by the sheet metal council of Canada, which has adopted a council standard sheet, which has a coating of zinc of not less than 1.75 ounces to the square foot, Conover asserted.

The institute will patent the name and lease the right to use the name and properly heavily coated sheets by companies willing to make such a sheet. In turn, the institute will start a promotional program, which will include the direct contact with the various county agricultural agents and advertising and other publicity means, where the consumer of galvanized sheets, principally the farmer, can be reached.

"Such a heavily coated sheet will enable the galvanizing industry to offer the public a product that can be guaranteed and which will be able to compete with other forms of roofing," Conover said. "The good name and reputation of zinc-coated sheets will be protected and lost business regained, the same as it has proved in Canada, where the sheet business would have been in the same shape as it is in the United States today."

Results of the field work done by the institute, through G. C. Bartells, technical assistant of the institute, were presented by Bartells in a paper and with pictures. The survey showed that many of the galvanized roofs constructed before the war, when sheets contained an ample coating of zinc are still in good condition, while many of the thinly coated sheets of the present time are not giving satisfactory service.

In his field work, which has consisted of direct contact with the farmers and other users of galvanized sheets, Bartells finds that users are still anxious to use galvanized sheets for building purposes, provided a better product is made, and also are willing to pay an additional cost for the properly coated sheet.

A paper, "What the Steel Roller Thinks of Heavily Coated Sheets," prepared by Laurence T. Miller, vice president of the Granite City Steel Company, and read by C. N. Anderson, disclosed that the galvanizers are willing and anxious to make such a product, provided an educational program, such as the galvanizing plan proposes, is adopted by the institute. He also warned the zinc industry that if it did not do something along this line that it would lose more of its galvanizing business.

FROM JOBBER'S VIEWPOINT

Roy Destaeble discussed the heavily coated idea from the viewpoint of the

jobber. He has been a supporter of some plan for a number of years, and seven years ago attended a meeting of the Sheet Steel Association, at which he presented a paper on such a plan and at which the association passed a resolution indorsing the Master Brand plan of the institute, promulgated by Destaeble and F. C. Wallower, then president of the institute. This action, Destaeble said, shows that the steel people are in sympathy with some sort of a galvanizing program that will enable sheet rollers to produce a better sheet. He also stated that as a jobber of galvanized sheets that he could sell a heavily coated sheet in preference to a thinly coated sheet with its lower price.

C. F. Dike, Frank Childress, W. N. Smith, Howard Young, and others made



J. D. Conover, reelected secretary of the Zinc Institute

short talks favoring the institute's plan as outlined by Secretary Conover.

Ore producers and representatives of smelters agreed to finance the research and production promotion program by contributing 25 cents a ton on slab zinc and 12½ cents a ton on zinc concentrates. Secretary Conover said it was anticipated about \$75,000 a year would be obtained in this manner.

Centralized milling in the Tri-State District was discussed in a report read by Elmer Isern, of the Commerce Mining and Royalty Company, in which the success of the Bird Dog mill of the company was described at the afternoon session.

Papers on zinc smelting in Mexico, the Evans-Wallower Lead Company's electrolytic zinc plant, developments in the use of zinc pigments, and a paper on the situation in Russia were read at the afternoon session by S. H. Levison, Foster

S. Naething, H. A. Nelson, and M. W. Latimer, who read the paper on Russia prepared by Normon Rood.

The second day's activities were brought to a close by the annual banquet, at which Victor Rakowsky presided.

An address, "The Business Outlook," made by John C. Howell, consulting economist, was the main feature of the dinner.

USE OF NATURAL GAS IN REDUCTION OF ZINC

A new methane-gas process of zinc reduction was described at the Wednesday morning session by R. S. Dean, chief engineer, Metallurgical Division, U. S. Bureau of Mines. The process, which is expected to have a revolutionary effect on the production of metallic zinc from relatively low-grade ore, is the invention of Charles G. Maier, metallurgist at the Pacific Experiment Station, Berkeley, Calif. It follows three years of experimental study by the Bureau of Mines to determine if zinc-smelting costs could be reduced and high quality maintained. In view of the recent decreasing returns from zinc production this solution is timely.

By Mr. Maier's invention zinc of electrolytic purity is producible with comparative economy. This is a significant application of exact knowledge of fundamental, chemical, and metallurgical laws to the practical requirements of industry. "No one will doubt but that zinc will be smelted continuously for many years to come," said Mr. Maier, "but if the smelting industry is to remain profitable, its methods must be improved from the standpoint of conservation of energy and labor. These considerations mean the better use of fuel and large-size, direct-acting reduction units. It is in just these latter directions that a precise knowledge of chemical fundamentals may be expected to define the limits of imaginative possible projects; and if the smelting industry makes full use of the chemical data now available, it can not fail to improve the practice of smelting and may even attain the recurrent goal of the zinc metallurgist, the so-called direct smelting of zinc to liquid metal. Quantitative physical chemistry is now able to point out under what conditions and by what means this is a physical possibility."

Thermodynamic calculations made at Berkeley enabled the prediction of the chemical combination of zinc oxide from the ore and of methane or natural gas at a certain temperature. This degree of heat, less than 1,000° C., is comparatively less than that required in other methods and is vitally effective in economy of plant construction and of operation. These and the other advantages of low maintenance, minimized labor, high

recovery, and quality of product are featured in the Zinc Institute discussion.

(The possibilities of the new method forecast from the Berkeley research have been proved by trial at the Rare and Precious Metals Experiment Station at Reno, Nev., and detailed in Report of Investigations 3091, issued by the Bureau of Mines, Washington, D. C.)

Engineers' Week at the University of Utah

Engineers' Week was celebrated at the University of Utah from April 6 to April 11. It was sponsored by the Engineering Society (made up of undergraduate students in engineering), by the engineering faculty, and by the university authorities. The engineering laboratories were open to the public to permit their inspection by visiting engineers, as well as all others. All the laboratories were in operation at the time so that visitors might acquaint themselves, not only with the extent to which the engineering school of the university is provided with laboratories and equipment, but likewise the nature of the work which is carried on. Guides were provided and all the members of the several engineering societies of the state were invited to visit the university.

The outstanding feature of the week was a lecture by Dr. H. T. Plumb, consulting engineer for the General Electric Company in the inter-mountain district. The lecture was preceded by a dinner at which the engineering students were hosts to the professional engineers of the state. Among the guests of honor were Gov. George H. Dern, the secretary of state, the Mayor of Salt Lake City, and the members of the board of regents of the university. After the dinner the guests and members of the various engineering societies present assembled to hear Dr. Plumb's lecture and to witness a demonstration of high frequency and high voltage currents, artificial thunder and lightning, corona discharges and effects, the photo-electric cell, and the art of painting with electricity and light.

Como Mines Elects Officers—Development Planned

Charles P. Franchot, Buffalo, was elected vice president of the Como Mines Company, a Nevada corporation which controls 36 gold and silver claims in the territory in which the famous Comstock Lode is located, at a recent meeting of the company.

The officers of the company are: President, Charles Oster, New York; vice president, Charles P. Franchot, Buffalo; secretary and treasurer, E. S. McCurdy, E. M., San Francisco. In addition to

these officers, the directorate includes T. R. Cowell and R. M. Atwater, Jr., New York, who is consulting engineer.

The Como Mines Company controls the Como, North Rapidan, Buckeye, Peer and Star of the West mines comprising 31 claims, and the Lucky Sunday Mining Company with five claims. These 36 gold and silver claims are in Lyon County, Nevada, about 10 miles from the Comstock Lode.

Former workings on the Como claims developed the ore bodies to a depth of 350 feet below the surface and more than \$1,000,000 in gold was recovered during operations. Present plans call for the extension of a tunnel, already completed to a distance of 4,000 feet from the portal, in two directions to the Como and Rapidan veins. Modern electrified equipment, including compressor, storage battery locomotive, mucking machines, steel transformer station and all necessary buildings, has been installed at the tunnel.

Fred W. Price Dies

Fred W. Price, prominently identified with western mining for many years, died at his home at Salt Lake City, April 1, at the age of 68 years.

Mr. Price was a native of Wales, and came to the United States at the age of 16. For several years he engaged in mining in Canada, Idaho, and California. He had been in Utah about 40 years. He was the locator and president of the Cardiff Mine in Big Cottonwood Canyon, and also organized several other properties in Utah, Nevada, and California. He was active in political, as well as mining, life in Utah for many years.

Golden Chariot-War Eagle Mines Company Elects Officers

The Golden Chariot-War Eagle Mines Company, of Idaho, at a recent meeting in New York City, elected William R. Wade to succeed Kirby Thomas, as president, and Harris Hammond, of New York, and Kirby Thomas as vice presidents. Mr. Wade and Harris Hammond, Kirby Thomas and Frank Spencer Lewis, of Philadelphia, constitute the eastern directorate of the company. Mr. Wade was made managing director of the company and Kirby Thomas consulting engineer.

The Engineers Exploration Syndicate, 120 Broadway, New York City, of which Harris Hammond is president, has taken an option on the company treasury stock and will have direction of the operations. A. E. Bowdway, an engineer formally associated with the Dominion Exploration Company in their extensive air exploration in Northern Canada, will be local manager.

The company was organized by Kirby Thomas and acquired extensive holding in Owyhee County, Idaho, including the Oro Fino, Golden Chariot, Minnesota South Chariot, Mahogany and Cumberland mines. These mines are credited with a production of \$12,000,000 in gold, much of which was high grade ore. The production was mostly prior to 1876 and when these properties were involved in the disastrous collapse of the Bank of California.

The company also controls the Sinker Tunnel which has cut the values at a depth of 2,200 ft. and which is over 6,500 ft. long. Operations will be carried on through the Sinker Tunnel.

Production of Pyrites in 1930

The production of pyrites in 1930 amounted to 347,512 long tons, valued at \$1,028,680, it is announced by Scott Turner, director of the Bureau of Mines. These figures may be compared with a 1929 production of 333,465 tons, valued at \$1,250,141. Production in 1928 was 312,815 tons, valued at \$1,081,758. The figures include by-product pyrite and pyrrhotite concentrates from Tennessee, pyrite concentrates from New York, and partly-desulphurized tailings from zinc operations in Wisconsin.

As in preceding years, pyrites was produced in California and Virginia. The only new production of pyrites was in New York, where the St. Joseph Lead Co. produced 15,474 tons of concentrates at its Balmat mine.

The quantity of pyrites sold or consumed by producing companies totaled 350,177 tons in 1930, 336,456 tons in 1929, and 310,250 tons in 1928. In 1930 the pyrites produced contained approximately 124,226 tons of sulphur; in 1929, 120,371 tons; and in 1928, 113,305 tons.

Imports of pyrites in 1930 were 368,114 tons, valued at \$1,037,017, a decline in quantity of 28 per cent in comparison with the 514,336 tons, valued at \$1,507,648, imported in 1929. Of the total imports in 1930, Spain furnished 325,992 tons; Canada 42,117 tons; and Russia 5 tons.

The president and secretary of the American Institute of Mining and Metallurgical Engineers and the members of the Lake Superior Section of the institute will be invited to attend the dedication of the new engineering building at the Michigan College of Mining and Technology in August, according to an announcement by President W. O. Hotchkiss. The dedication will be held in connection with the Michigan Tech Alumni reunion, which will be held here August 6, 7, and 8.

New Motion Picture Films Depict Story of Steel

"The Story of Steel," from the mining of iron ore to the manufacture of finished steel products, is depicted interestingly in a series of educational motion pictures just released for free circulation by the United States Bureau of Mines. These motion pictures, which constitute a notable addition to the bureau's extensive collection of films that visualize the workings of American mineral industries, have resulted from extensive revision of a picture prepared some years ago. They have been produced by the bureau in cooperation with an industrial concern, and are available on both 35 and 16-millimeter width of stock.

One film of two reels, "Mining and Metallurgy," shows the geographical and geological location of the iron ore deposits; transportation of ore from mine to blast furnace by boat and railway; reduction of the ore in the blast furnace to pig iron or molten iron for further processing in Bessemer, open hearth or electric furnaces; and the pouring of ingots, weighing 2 to 4 tons, from which steel products are made. It also shows the making of coke in by-product ovens.

Other films are titled, "Rails, Rods, and Plates," "Wire Products," "The Manufacture of Pipe," "Sheets and Tin Plates."

Copies of these films may be obtained for exhibition purposes by schools, churches, clubs, civic and business organizations, miners' local unions, and others interested by applying to the Pittsburgh Experiment Station of the United States Bureau of Mines, Pittsburgh, Pa. No charge is made for the use of the film, although the exhibitor is asked to pay transportation charges and for loss or damage in excess of normal wear and tear.

Postponements in Asbestos Investigation

On March 30, 1931, the Tariff Commission ordered an investigation concerning alleged unfair practices in the United States in the sale of Russian asbestos, and fixed May 4 as the time for filing respondents' answers and May 19 as the date for the public hearing therein. The respondents named in the complaint are the Amtorg Trading Corporation and Asbestos Ltd., Inc. The commission has granted a request for a postponement of the hearing to a date to be later announced. It has also decided to extend the time for respondents' answers to a date to be fixed later.

In order to preserve the status quo and to protect the interests of all parties in the investigation, the Treasury Department, at the instance of the commission,

has been requested to issue an order stipulating that further entry of Russian asbestos, a free-list commodity, shall be made upon bond pending the conclusion of the investigation.

Nelson S. Greensfelder Fatally Stricken

Nelson S. Greensfelder, advertising manager of Hercules Powder Company and nationally known authority on industrial advertising, died at Wilmington, Del., Sunday morning, April 5.

The end came suddenly after a short illness, which quickly developed into



pneumonia. He is survived by his wife, Grace Gleason Greensfelder, and 7-year-old son, Robert J., and by his parents, Judge and Mrs. J. B. Greensfelder, Kirkwood, Mo.

Mr. Greensfelder was born in St. Louis County, Mo., March 20, 1891. He attended Colorado College and later the Colorado School of Mines, graduating in 1913 as an engineer of mines. He entered the employ of Hercules Powder Company as a salesman and demonstrator and, upon showing ability as a writer and advertiser, was transferred to the home offices in Wilmington. He became advertising manager in 1924.

A number of his activities brought Greensfelder into national prominence. One of the organizers of the National Industrial Advertisers' Association, he became its president and represented the organization at the world advertising institute in Berlin, Germany, in 1929.

He was director of *The Explosives Engineer*, published by the Hercules Powder Company, a magazine of international circulation sponsoring safer and better methods of using explosives. Through

The Explosives Engineer he was instrumental in instituting the National Safety Competition, annually awarding trophies to the winners of this competition. Under the U. S. Bureau of Mines this safety movement has been responsible for wide reduction in industrial accidents.

Mr. Greensfelder was active in Boy Scout work and was to have represented Delaware at the National Scout Council in Memphis, Tenn., in May.

Other groups in whose activities he took a prominent part are The American Mining Congress, American Institute of Mining & Metallurgical Engineers, National Crushed Stone Association, National Safety Council, Pine Institute of America, Institute of Makers of Explosives, and Association of National Advertisers.

New Metal Statistics Handbook Issued

The twenty-fourth annual edition of "Metal Statistics," covering the year 1931, has just been published by the American Metal Market, 111 John Street, New York. This book is one of the most valuable and most widely used yearbooks published. The statistics cover a wide range of interest, supplying a complete record in every instance on production, consumption, imports, exports, stocks, average prices, trade terms, specifications, grades, brands, analyses, customs duties, etc., applying not only to the raw material, but also to the semi-finished and finished products. As in previous editions, various new tables have been introduced, covering miscellaneous economic subjects.

Committee To Make Thorough Study of Mine Timbers

A thorough study of mine timber will be made by the American Mining Congress with a view of arriving at the most economical size, the most serviceable species and the most suitable grade, either treated or untreated, to meet the various requirements of the mining industry.

The investigation will be carried on by the Mine Timber Committee of the National Standardization Division of the American Mining Congress under the chairmanship of Reamy Joyce, of Chicago, vice president of the Joyce-Watkins Co., a specialist in timber for mine, railroad and other industrial uses and in wood preservation methods. Mr. Joyce is organizing sub-committees on a geographical grouping to study and recommend methods for application to all the mining fields of the country so that the standards decided upon will apply nation-wide. He will also organize

a service records committee which will function for the mining industry along the same lines as are being carried out by the American Railway Engineering Association and the American Wood Preservers' Association.

"The future work of the Mine Timber Committee will be along the lines of studying the grades, species and sizes of timbers used by the mining industry, with particular reference to the nature of their use and whether for permanent or temporary service," said Mr. Joyce in outlining its contemplated activities. "The committee will compile authentic data on the life of mine timbers, both treated and untreated, which will be of value. Mine timber has been looked upon as a necessary evil by a considerable portion of the mining industry where the subject has been considered to any extent. The high cost of labor in the mines makes for a high timbering cost if the life of the timber used is unnecessarily short. It is important that the subject of mine timber be studied with the object in view of arriving at the most economical size, the most serviceable species and the most suitable grade, either treated or untreated, to meet the various requirements in the mine. The sub-committees of the Mine Timber Committee are being arranged on a geographical grouping so that it will be possible to have representative committee meetings."

Fuel Briquet Industry Show Large Output for 1930

In 1930, for the second time in the history of the industry, the production of fuel briquets exceeded 1,000,000 tons. According to reports furnished to the Bureau of Mines by the operators of briquetting plants, the total output was 1,028,865 net tons, valued at \$8,028,736. This represents a decrease of 15.1 percent in tonnage and of 15.6 percent in value from the preceding year. Though production declined in 1930, it was still well above the high level set in 1926, when demand was greatly stimulated by the anthracite strike. The fact that output remained high in 1930, at a time when supplies of anthracite and bituminous coal were ample, is a definite indication of growth and stability in the briquetting industry.

The production of 175,503 tons of briquets in January, 1930, was the outstanding feature of the year, being only a few tons less than the previous record of 175,960 tons in December, 1929. April marked the lowest ebb of output.

The average value f. o. b. producers' plants in 1930 for the Central States was \$8.13, the same as for 1929. The average value for the State of Pennsylvania was \$6.22, the same as in the preceding year.

A total of 1,034,365 tons of raw fuel of all kinds was briquetted in 1930. Of this, 37 percent was anthracite and semi-anthracite, 57 percent semibituminous and bituminous coal, and 6 percent was semicoke and carbon residue from the manufacture of oil gas.

Asphaltic pitch was employed as a binder either alone or in combination by 21 out of the 25 plants. Two plants, one briquetting oil-gas carbon and one using lampblack from oil-gas, required no binder.

Three of the 23 plants using a binder reported that they recarbonized briquets after coming from the presses in order to drive off smoke from the binder.

Twenty-five plants were in operation in 1930—the same number as in 1929. Four plants active in 1929 produced no briquets in 1930, but four new ones began commercial operation during the year.

Imports of fuel briquets in 1930 were 73,418 net tons, a decrease of about 18 percent from 1929. About 85 percent of the total importations in 1930 were received at Massachusetts ports, and over 99 percent of the total originated in Germany.

Mine Inspectors Institute Meets at Richmond, May 4 to 6

The annual meeting of the Mine Inspectors Institute of America will be held May 4, 5, and 6, at the John Marshall Hotel, Richmond, Va. C. A. McDowell, safety and personnel manager, Pittsburgh Coal Co., is secretary.

Papers and discussions dealing with the following subjects will be presented:

Direct and Indirect Cost of Mine Accidents; Value of Local Mining Institutes; Value of Organized Safety to the Mining Industry; Method of Sealing and Reopening Barrackville, W. Va., Mine Fire; Prevention of Accidents from Roof Falls; Value of Systematic Air Analyses in Relation to Mine Ventilation.

Trips are planned to historic Jamestown, Williamsburg, and Yorktown.

Illinois Mining Institute to Meet June 5 to 7

The Illinois Mining Institute will hold its mid-summer meeting aboard the S. S. *Cape Girardeau*, leaving St. Louis, Mo., on Friday, June 5, and returning June 7.

Rocky Mountain Institute to Meet at Denver, June 3, 4, and 5

The annual meeting of the Rocky Mountain Coal Mining Institute will be held June 3, 4, and 5, at the Cosmopolitan Hotel in Denver, Colo. An unusually attractive program is being arranged, with special attention being given to the subject of "modernized equipment."

A. I. M. E. Committee Reports on Employment in Russia

Many members of the American mining fraternity have been offered employment in Soviet Russia, and have asked for advice. A special committee appointed by the board of directors of the American Institute of Mining and Metallurgical Engineers has made a careful study of the situation and has submitted a report which has been approved and adopted by the board and is published in *Mining and Metallurgy* for April.

Named Assistant Secretary of Standards Association

The appointment of Cyril Ainsworth as assistant secretary of the American Standards Association has just been announced by Bancroft Gherardi, president of the Association.

Mr. Ainsworth, who has been in charge of ASA safety code work during the past year, succeeds F. J. Schlink, assistant secretary for the last eight years. Mr. Schlink recently resigned to give full time to the technical direction of Consumers' Research, Inc.

George W. Curran Named Coal Club President

George W. Curran, president of the Curran Coal Company, was elected president of the St. Louis Coal Club at a meeting of that organization on April 13. Approximately 75 members of the club were in attendance.

Value of Canadian Mineral Production for 1930 Down 10 Percent

Due to the drop in metal prices and lower outputs of coal, asbestos, gypsum, clay products, cement, and lime, Canada's 1930 mineral production, \$278,470,563, showed a decrease of 10 percent from 1929, according to the Department of Commerce. Increases in production were reported in gold, copper, zinc, silver, and lead. The total value of the metals group amounted to \$142,949,293, against \$154,454,056 in the previous year. Fuels, consisting of coal, natural gas, and crude petroleum, at \$67,888,334 decreased nearly 12 percent. Clay products, including building brick, drain tile, hollow blocks, etc., totaled \$10,697,218, as compared with \$13,904,643 the previous year. Cement output declined about 10 percent and lime nearly 25 percent; stone, sand, and gravel production were higher than in 1929.

During the past year approximately 500,000,000 pounds of explosives were transported by the railroads of United States and Canada without an accident or the loss of a life.



Novel Coal Sampling Truck Placed in Service by Bureau of Mines

An automobile truck, especially equipped for the taking of samples of coal at the mine, has just been placed in service by the United States Bureau of Mines. This truck, which embodies many novel mechanical features, is designed to facilitate the work of the bureau in its studies of the characteristics of coals from the different fields. Approximately 1,000 coal samples are analyzed monthly, the work involving more than 100,000 different chemical determinations annually, it is pointed out by Scott Turner, director of the bureau.

A swing-hammer type crusher adjusted to crush the coal to less than one-fourth inch mesh, directly connected to a four-cylinder gasoline engine power unit, is mounted on a specially designed truck body. From the crusher the coal passes through a "rifle," which accurately splits it into two equal parts, the first step in reducing the 1,000-lb. sample collected at the tippie to the 5-lb. sample required

for the laboratory tests. An air compressor, driven from the same power unit, supplies compressed air to clean the crusher and rifle after preparing each sample in order that the next sample will not be contaminated by any coal remaining in the crusher.

Formerly considerable time was consumed, first in shipping the sampling equipment from one railroad station to another and from the station to the mine, and then in crushing each 1,000-lb. collected sample by hand to one-fourth inch size, as required by the standard method of sampling.

With the new truck considerable time is saved both in moving from one mine to another in a district and in crushing and reducing the sample after it has been collected. It is estimated that twice the number of samples can now be taken and prepared at practically the same cost and in the same time as formerly.

Anthracite Institute Seal of Approval Meets Favorable Reception

The adoption of a seal of approval by the Anthracite Institute as a mark of identification on hard coal burning equipment fulfilling the requirements set up by the Laboratory of the Institute, as recently announced, is meeting with enthusiastic reception from equipment manufacturers, retail coal merchants and representatives of allied trades, according to C. A. Connell, acting executive director of the institute.

The initials of the Anthracite Institute are used as the identifying mark in the seal, guaranteeing both the dealer and purchaser that the equipment thus marked has proven satisfactory under an extensive series of carefully conducted investigations and tests.

More than 70 devices have been submitted by equipment manufacturers in the initial series of tests. A waiting

list has been established for the testing of additional equipment.

To date permission to use the seal has been extended to manufacturers of five stokers, four thermostats, three anthracite burning service water heaters, two blower systems, two vacuum cleaning devices and one space heater. The remaining equipment submitted is undergoing investigation in the laboratory or has been returned to the manufacturer for improvements, suggested as the result of tests.

It is the experience of the Institute, it was stated, that in almost every instance where a hard coal burning device has been returned to the manufacturer for deficiencies in operation, the equipment makers' engineers have agreed with the findings of the institute's laboratory with regard to the shortcomings of the device and have taken, in turn, immediate steps toward remedying the apparatus, along the lines suggested.

As the seal is for use on completely developed devices only, the correction of equipment fundamentally sound but defective in minor detail tends to reduce service costs, thus aiding manufacturers in lowering expenses.

In the industry, the use of the seal is interpreted as one of the most important steps yet taken by the Anthracite Institute in its campaign to standardize hard coal burning equipment.

In connection with the setting of a standard for heating equipment, the Anthracite Institute also has adopted the practice of issuing periodical bulletins, containing brief descriptions of approved appliances, such as a resume of performance data, approximate cost, dimensions, etc. In addition, it is the intention of the institute to issue pamphlets, describing interesting phases of the laboratory activity.

Third International Conference on Bituminous Coal

Important delegations of fuel technologists from the principal European countries will attend the Third International Conference on Bituminous Coal at the Carnegie Institute of Technology, Pittsburgh, Pa., on November 16 to 21, according to Dr. Thomas S. Baker, president of the Institute of Technology and organizer of the congresses.

Conferences with scientists in the coal centers of Europe during a two months' visit assured Dr. Baker of the interest and cooperation of fuel technologists on the continent. The success of the two preceding meetings that have been held in Pittsburgh have demonstrated the importance of the conferences as occasions where outstanding scientists throughout the world may explain and discuss their discoveries.

The program of the third meeting, embracing the more important topics in fuel technology now being considered throughout the world, is progressing rapidly. Since Dr. Baker's return from Europe he has devoted his time to arranging the American program as well as to corresponding with scientists in Europe. In America great progress has been made in research since the last conference in 1928, and the program this year will contain announcements of significant developments made in research laboratories in the United States.

Special efforts are being made by the committee in charge to arrange inspection visits to the important research laboratories and industrial plants in Pittsburgh and other parts of the country in connection with the conference.

Fuel technologists who wish to contribute papers to the conference are urged to apply to the secretary as soon as possible, as the program is rapidly being compiled.

National Coal Credit Corporation Formed

Articles of incorporation of the National Coal Credit Corporation (non-profit) were signed April 24 and will be filed in Columbus, Ohio. The incorporators are: C. C. Dickinson, Charleston, W. Va., president, Dickinson Fuel Company; D. D. Hull, Jr., Roanoke, vice president, Virginia Iron, Coal & Coke Company; and K. U. Meguire, Louisville, president, Dawson Daylight Coal Company. The principal office of the new corporation will be located in Cincinnati and the primary purpose will be to gather and disseminate credit and related information with respect to the coal industry.

In line with the resolution that was adopted at the meeting on April 15 of the Commercial Research Section of the Market Research Institute of the National Coal Association, to the effect that it would be advantageous to develop the broadest possible credit information service for the industry and that a central bureau for credit interchange and delinquent accounts reports service within the industry be formed, a representative group of operators met at Cincinnati and determined on the above course. It is planned to organize a strong board of trustees for the new corporation, which is separate from the National Coal Association. That the credit situation within the industry warrants an effort in this direction was the unanimous opinion of those who attended the meeting at Cincinnati, and who believe that, through the new organization, an increasing degree of "credit consciousness" can be developed within the industry. It will be some weeks before the National Coal Credit Corporation will commence to function. According to present indications, it will represent, at the outset, a tonnage of about 175,000,000 tons. The next meeting of the group will be held in Cincinnati on May 14, at which further organization details will be considered.

Meeting of Coal Classification Committee

In connection with the annual meeting of the American Society for Testing Materials, held in Pittsburgh the latter part of March, conferences of the three technical committees of the general committee on coal classification were held. The subcommittee on scientific classification, in a two-session conference, devoted much time to the consideration of the methods of testing coals for different qualities affecting their fuel value and proper weights to be given the different qualities in arriving at a standard code. It also discussed methods of testing and grading coal for friability, degradation under exposure, coking properties, and

other characteristics. While no definite action was taken on any of these questions, the reports of subcommittees indicated substantial progress toward final agreement.

The subcommittee on use classification, besides hearing reports from members who had been analyzing the adaptability of coals for specific uses, extended the field of its operations by arranging for similar studies of coal used in the manufacture of cement and in the ceramic industry.

The committee on marketing practice discussed at considerable length, without reaching a final conclusion, the question of the proper points of division between low, medium and high volatile coals. In that connection the National Coal Association agreed to compile a statement with reference to the requirements of smoke ordinances in the large cities of the country.

Production of Coal in March

The total production of soft coal for the country as a whole during the month of March is estimated by the Bureau of Mines at 33,870,000 net tons, an increase of 2,462,000 tons over the February tonnage. The increase, however, was due to the fact that there were 26 working days in March as against an approximate 23.9 days in February. The average daily rate for March was slightly lower than that for February—1,303,000 tons in comparison with 1,314,000 tons in February. Production during the month of March, 1930, was at the daily rate of 1,376,000 tons.

Anthracite production declined sharply in March. The total for the month amounted to 4,745,000 net tons as against 5,391,000 tons in February. The average daily rate in March was 182,500 tons as against 229,400 tons in February, indicating a decrease in March of 20.4 percent.

John C. Kennedy Engaged as Field Man for Safety Committee of the National

John C. Kennedy, Charleston, W. Va., has been named field man in charge of the organization of safety institutes, and the like, by the Safety Committee of the National Coal Association, according to announcement this week by Milton H. Fies, Birmingham, Ala., vice president of the DeBardeleben Coal Corporation and chairman of the committee. Final plans for the work will be outlined by a subcommittee in accordance with the program which was adopted at the Chicago conference on March 17. This committee is headed by J. Wm. Wetter, Philipsburg, Pa., general manager of Madeira Hill Coal Mining Company, and the other members of the committee are: R. V.

Clay, Cleveland, assistant general manager, Hanna Coal Company; George Dunghinson, Jr., Bluefield, W. Va., manager, fuel department, Norfolk & Western Railway Company; Lee Long, Dante, Va., vice president, Clinchfield Coal Corporation; and Howard Willets, New York, vice president, Alamo Coal Company (Colorado). Mr. Kennedy will attend the annual meeting of the Mine Inspectors' Institute, to be held in Richmond, Va., early in May, at which meeting he will present the program of the bituminous coal industry. Mr. Kennedy has an excellent background for the work upon which he is entering. An alumnus of the University of West Virginia, he worked four and one-half years as assistant mine foreman for the Elk River Coal & Lumber Company and two years as safety director of the West Virginia Department of Mines.

New Edition of Keystone Coal Buyers Catalog

The 1931 edition of Keystone Coal Buyers Catalog and Mine Directory is being distributed. This edition has been revised throughout. Additional information includes the names, titles and addresses of the vice president in charge of operations, general manager, general superintendent, mining engineer, electrical engineer, purchasing agent and store buyer; and at the individual mines the name of the mine superintendent, mine electrician, etc.

The name of the president, sales manager or sales agent and their addresses; the name of the mine, post office, shipping point, railroad, seam mined, number of employees, daily capacity, together with detailed information on preparation equipment, will be carried as heretofore.

With the revised, extended and improved information contained, it is said that this new edition will be the best ever available to the coal buyer.

The publishers are Keystone Coal Buyers Catalog and Mine Directory, 475 Tenth Avenue, New York.

Last year railroads handled 500 million pounds of dangerous explosives without a fatality, with only two persons injured and a property loss of only \$71. In 1907 the property loss was \$500,000. Railroads also handled millions of pounds of acids, compressed gases, corrosive and poisonous liquids and scores of other dangerous articles without a fatality, according to the American Railway Association.

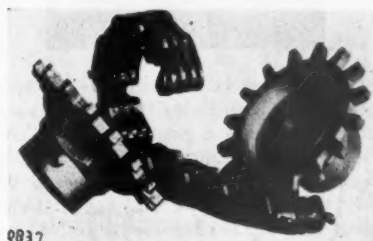
Employees at 16 mines and 3 tailing mills in the Tri-State district worked throughout January and February without suffering a lost-time accident, according to records of the accident prevention department of the Tri-State Zinc and Lead Ore Producers' Association.

WITH THE MANUFACTURERS

Morse Company Places Midget Chain on Market

Shaft flexibility in power transmission is fast becoming a major factor for consideration in small horsepower installations. The high cost of worn bearings, due to misalignment and general machinery depreciation due to vibration, as well as costly breakdowns and delays due to these inefficiencies is comparatively just as important on the small installations as on the 5,000-hp. jobs.

The big problem among flexible coupling manufacturers has been to design a practical coupling that can be supplied at low cost. The new Morse Midget recently placed on the market is a minia-



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ture counterpart of the Morse chain-and-sprocket coupling that has proven so practical on installations up to 5,000 hp. The manufacturers, the Morse Chain Co., Ithaca, N. Y., division of Borg-Warner Corporation, state that the simplicity of design—two sprockets wrapped by a chain—has withstood the most strenuous tests in constant operation in numerous lines of business over a period of years. Their new Midget coupling, designed for shaft sizes up to 1 in. in diameter, is remarkably efficient, due to a total lack of complicated parts. Due to its all-steel construction, it will give trouble-free service with exceptionally long life. Literature may be had by addressing the Morse Chain Co., Ithaca, N. Y.

Link-Belt Company, Indianapolis, Ind., have just issued a new illustrated book, No. 1293, which describes the complete line of positive drives: silent chain, roller chain, herringbone gears, herringbone speed reducers, worm gear speed reducers, steel and malleable chains, P. I. V. gear.

Many illustrations of installations of these positive drive units are shown, with accompanying description.

DuPont Issues Explosives Chart

"Brands of duPont Explosives and Uses to Which They are Adapted" is the title of the seventh edition of a chart issued by E. I. duPont de Nemours & Company, for the purpose of aiding users of explosives to avoid the purchase of unsuitable explosives and to select those which will give the best results in proportion to cost.

Worm Gear Reducer Catalog

Footo Bros. Gear and Machine Co. have issued a new catalog (No. 301) on IXL Hygrade Worm Reducers. The book has been prefaced with a chapter on the evolution of worm gearing, starting out with the earliest use of this form of gearing, and bringing it down to the present day, with reasons for the various changes and improvements in design. A chapter entitled, "The Customer's Problem," presents information in regard to design, manufacturing methods, materials and selection of units, as well as valuable data on efficiencies heretofore not available.

Traylor Reduction Crusher

The Traylor Engineering & Manufacturing Company, Allentown, Pa., has published a bulletin (No. 110) illustrating and describing their new ore and rock Reduction Crusher.

The company announces that on and after May 1 their New York office will be located in the Empire State Building, Room 2513.

R. R. Shafter is in charge there.

A pocket size booklet which shows a list of the products of the American Chain Company, Inc., and Associate Companies has just been issued. As stated in the foreword, a perusal of the pages of this booklet indicates the broad field of manufacturing activity in which this group of companies is engaged.

F. C. Thompson, vice president and general manager of Morse Chain Company, Ithaca and Detroit, subsidiary of Borg-Warner Corporation, announces the appointment of R. W. Appleton as purchasing agent at Ithaca, N. Y. Mr. Appleton was formerly director of purchases of Pierce Arrow Motor Car Co.

Safety Appliances Company Announces an Improved Self-Rescuer

The Mine Safety Appliances Company, of Pittsburgh, announces a new M-S-A Self-Rescuer now arranged in a new airtight steel case of improved design and



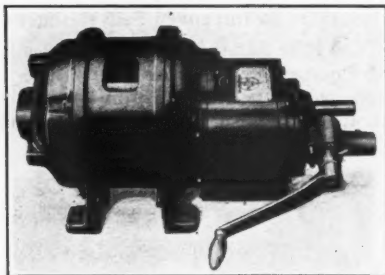
tested for leakage under 10 pounds pressure. The Self-Rescuer consists of a small canister with mouthpiece directly attached, provided with filters for keeping out smoke and a chemical for transforming deadly carbon monoxide into harmless carbon dioxide. It is conveniently carried on the belt, for which a holder is provided, or in the pocket. In the event of a fire or explosion, a miner, wearing the Self-Rescuer, can travel for about 30 to 70 minutes in any concentration of carbon monoxide to be encountered. Its weight is 14½ ounces.

Roberts and Schaefer Company, of Chicago, recently closed a contract with the Pennsylvania Coal & Coke Corporation, Cresson, Pa., for the erection of a complete Marcus tippie at the company's Ehrenfeld No. 3 Mine. The plant will prepare and load three sizes of coal, with a capacity of 450 tons per hour.

Mr. Walter H. Wiewel has been made sales manager of The Timken Steel & Tube Company, Canton, Ohio, replacing Mr. A. J. Sanford, resigned. Mr. Wiewel has been associated with the company for several years as manager of steel sales in New York City.

New Combination Multi-Speed Drive and Motor

A multi-speed reduction gear unit built in combination with a standard a-c. motor has been developed by Roy T. Wise, consulting engineer, Westinghouse Electric and Manufacturing Company. Constructed to give four different speeds



to the output shaft at constant horsepower, this unit, known as the Westinghouse-Wise multi-speed drive, is applicable to those many industrial operations which, for highly efficient performance, require drives providing more than one speed. With this drive the speed of the driven apparatus may be changed instantly while the motor is running at full speed and under full load. All gears are constantly in mesh, and in no way can the operator injure the unit by changing speeds at any time.

This gear unit is mounted on a standard squirrel-cage Westinghouse induction motor. In the gear unit a pinion mounted on the motor shaft drives a gear mounted on the countershaft. Also on the countershaft are four idling ring gears, which are constantly in mesh with four gears that are pressed on the output shaft. Each of the countershaft gears is provided with an internal clutch, which is made to fit the bore of the gear. The clutch is actuated by two tapered wedges, which are forced between the clutch halves by a spring member. To bring this member to the correct position for a desired speed, the control handle, which is provided with a spur pinion, is rotated, actuating a rack, which is mounted on the spring member. This movement brings the spring member between the tapered wedges, thereby providing the pressure for clutching any one of the four ring gears to the countershaft, which, in turn, drives the output shaft at the desired speed.

Between each speed is a neutral position. To disengage the clutch and bring it into a neutral position, it is only necessary to rotate the handle to draw the spring member into a position which does not contact the expanding wedges. A further movement of the handle brings the spring member into contact with the next set of expanding wedges, and clutches the next gear to the counter-

shaft. Therefore it is not only possible to make speed changes under full load, but the apparatus can be stopped or started under that condition.

Ball bearings are used in both motor and gear unit, assuring high starting efficiency and unvarying alignment of shafts. The gearing in the first reduction, or drive from the motor to the countershaft, is of the single helical type, insuring quietness of operation, and the other gears on the countershaft and those on the output shaft are of the spur type. A simple but positive splash system is provided for lubricating both the gearing and the bearings. Oil is picked up by the gear teeth in the lower part of the case and delivered to mating gears and all other moving parts. An oil gage is provided for checking the oil level.

Because the motor and gear drive are built as one unit, installation is simplified, less space is required, and only one mounting bracket or foundation is needed since this unit is applied exactly like any motor.

The Westinghouse-Wise multi-speed drive is offered in three units, ranging in rating from $\frac{1}{2}$ to $7\frac{1}{2}$ hp. The four speeds available in the gear drive itself, plus the availability of motors giving different driving speeds, make it possible to choose a combination that covers a wide range of speeds.

Heavy-Duty Apron Feeder Announced By Link-Belt

A new, distinctive design of heavy-duty manganese steel apron feeder is being made by Link-Belt Company to meet the growing demand for a sturdier, more durable type of apron feeder for heavy-duty service.

The new feeder is suitable for handling either abrasive or non-abrasive material containing lumps of $\frac{1}{4}$ -in. size, and smaller, up to 6-ft. dimensions, being especially well adapted to the handling of extremely heavy, large, lumpy and abrasive materials.

The sprockets, chains, rollers and overlapping "non-sagging" apron pans are made of cast manganese steel, and the pans, which are ribbed, are $\frac{3}{8}$ in. to $1\frac{1}{2}$ in. thick, depending upon the service.

The chains have no small rollers, and they are placed underneath the pans at locations which break up the span of the pans. They are protected from dirt, and the stiff-back arrangement requires only a minimum of space and width for the feeder.

Full details, data, and illustrations, as well as installation views, are shown in folder No. 1251, which is being distributed by Link-Belt Company.

The spring meeting of the National Electrical Manufacturers Association will be held at Hot Springs, Va., May 18-23.

Marvin Appointed Hercules Advertising Manager

Theodore Marvin has been appointed advertising manager of Hercules Powder Company, it was announced by President Russell H. Dunham.

Marvin, who has been assistant advertising manager and editor of *The Explosives Engineer* magazine, assumes the post vacated April 5 by the death of Nelson S. Greensfelder.



The new advertising manager has been an employee of Hercules Powder Company for eight years. A graduate of the Colorado School of Mines, he became in 1923 associate editor of *The Explosives Engineer*, published by Hercules Powder Company, and in 1925 became its editor. In 1929 he was appointed assistant advertising manager.

Marvin has been active in both the advertising and technical publicity fields and is the author of handbooks on mining and tunnel methods. His appointment becomes effective immediately, according to official announcement.

Sullivan Machinery Representative Dies

George H. Richey, manager of the Boston office of the Sullivan Machinery Company, was killed in an accident on April 1. Mr. Richey had been a member of the organization since 1912, and manager of its New England sales office since 1919.

Edwin T. Hall, associated with Mr. Richey in the New England sales district for the past 15 years, has been named to succeed Mr. Richey.

Philip O. Schleussner Dies

Philip O. Schleussner, 53, first vice president of the Roessler & Hasslacher Chemical Co., Inc., New York, N. Y., and an active figure in the drug and chemical industry for over 25 years, died on March 21 at his home, "Wood Acres," Stamford, Conn.

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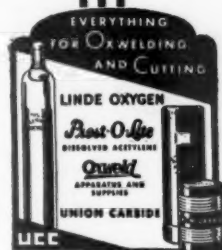
Dependable Welds

WHEN American industry is called upon for welded construction or assembly where the joint must be dependably strong and tight it adopts oxy-acetylene welding under Linde Procedure Control.

Linde Procedure Control is available to users of Linde Oxygen as a part of Linde Process Service. It provides design assistance, careful attention to selection of materials, instruction in correct welding technique and all other essential factors of good welding practice. It translates methods proved from a fundamental welding background into the actual needs of the specific welding application. It permits the Linde organization to focus upon the problems of one user of Linde Oxygen the combined experiences of thousands and the day-by-day discoveries of a large research staff.

Linde offers users of the oxy-acetylene process the best of everything for welding and cutting. Its nation-wide facilities make its service to you prompt, dependable, complete and economical.

If you are interested in the effective application of Linde Process Service and Linde products to your particular requirements, write or telephone the nearest Linde District Office.



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136 Producing Plants



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SO important is wire rope to industry—on excavating machines—on hoists—on elevators—and for a thousand and one purposes—that its users can afford only to specify a brand of proved dependability, economy and long life. Because of its outstanding records—and the known reliability of its maker—American Steel & Wire Company American Wire Rope will be found on most equipment where service requirements are severe.

*Made by the Largest Wire
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The illustration shows American Wire Rope
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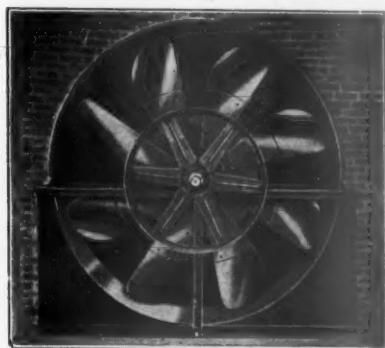
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ROBINSON VENTILATION

Fans and Blowers for every purpose



A Robinson reversible mine fan with steel housing and steel air drift side walls and steel air lock. This fan can be used economically where either blowing or exhausting.



The Robinson Coniflo Disk Fan with its rugged construction is ideal for ventilating small mines or mines where a very low pressure is encountered.



Robinson Tubing Blower for auxiliary ventilation. This unit is compact and light and can be moved from one place to another and connected to flexible tubing for driving air back to the face where it is impossible to get a good circulation of air from the main air current. Very inexpensive and a money saver.

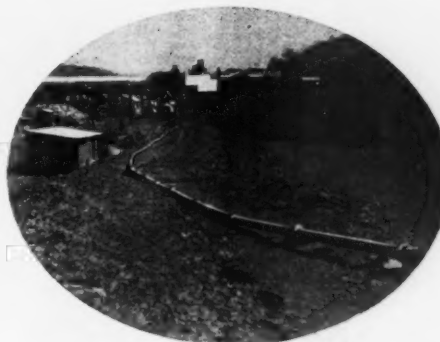
Consult Robinson Engineers at the Mining Congress Convention, Cincinnati, Ohio, May 11th to 15th inclusive.

BOOTHS—139 and 141.

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FLEXIBLE yet LEAKPROOF



SIMPLEX Cast Iron Pipe is furnished in 5-foot lengths, equipped with the Simplex Joint. Due to the short lengths and flexibility of joints, you can lay leakproof lines of Simplex Pipe over irregular surfaces and around curves and bends without the use of special fittings. You can locate your line on the narrow side of the gallery—between the track and rib—a thing impossible under ordinary circumstances with any other pipe. The joints are so simple to make and the pipe so easy to handle, that lines can be laid by common labor. These features, plus the well-known long life of cast iron pipe, making Simplex the favorite among mine operators. Write for free illustrated catalog "Simplex Prepared Joint Pipe."

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THE Lepley Bottom-Discharge Skips are always in balance with each other. The one dumping loses none of its weight as a counterbalance. A combined gate and chute restrains contents of skip while being hoisted and discharges from bottom into receiving chute without spillage. Opening of gate and chute gradually takes place during retarding stage of hoist. No time is lost at dumping bin. Hoisting capacity of shaft is in this way greatly increased.

Write for details of this power, coal and time saving skip.

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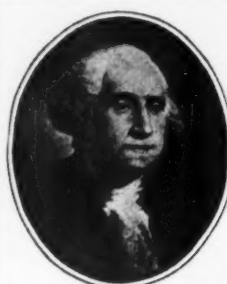
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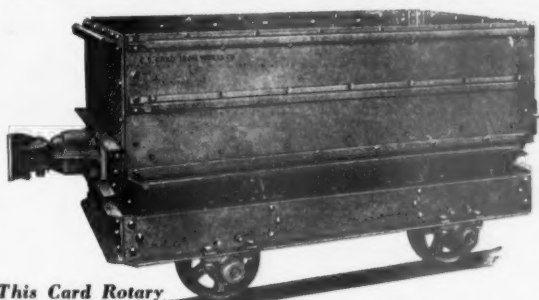
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This Card Rotary Dump Car is highly efficient. Note its rugged, simple design.

THE company using this special car says it is helping them get by under present metal prices! Don't make your mine a "proving ground"—buy Card Cars, standard equipment in many mines.

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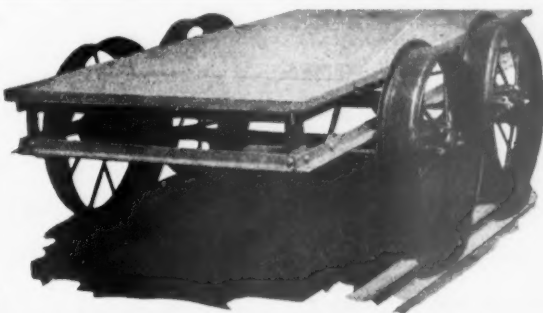
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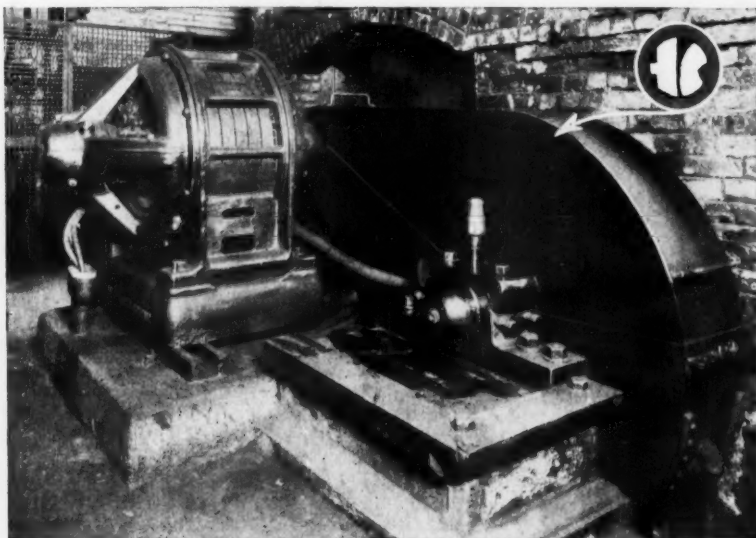
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